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## **RWANDA INTEGRATED WATER SECURITY PROGRAM (RIWSP)**

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### **Report on the implementation of Climate Vulnerability and Capacity Assessment (CVCA) in four selected communities of Kamababa watershed**



**September, 2012**

## **DISCLAIMER**

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## **Climate Vulnerability and Capacity Assessment (CVCA) in Kageyo and Nyamugali Cells of Mwili Sector, Kayonza District And Munini and Rwikiniro Cells of Rwimbogo Sector, Gatsibo District**

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## ACRONYMS & ABBREVIATIONS

AfDB	African Development Bank
ADRA	Adventist Development and Relief Agency
CBO	Community Based Organization
CC	Climate Change
COPRORIZ	“Coopérative pour la Promotion du Riz au Rwanda”
CSO	Civil Society Organization
CVCA	Climate Vulnerability and Capacity Assessment
DRR	Disaster Risk Reduction
EDPRS	Economic Development and Poverty Reduction Strategy
FARG	“Fond d’Assistance pour les Rescapés du Génocide”
EWSA	Electricity, Water and Sanitation Authority
FGD	Focus Group Discussion
GCM	Global Circulation Model
HH	Households
ICIWaRM	International Center for Integrated Water Resources Management
ICPAC	IGAD Climate Prediction and Application Centre
IGAD	Intergovernmental Authority on Development
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
KII	Key Informant Interview
LDC	Least Developed Country
MINAGRI	Ministry of Agriculture
MINALOC	Ministry of Local Government
MSMES	Micro, Small and Medium Enterprises
NAPA	National Adaptation Plan of Action
NBI	Nile Basin Initiative
NGO	Non Governmental Organization
PRA	Participatory Rural Appraisal
RAB	Rwanda Agriculture Board
RDB	Rwanda Development Board
RDF	Rwanda Defense Force
REMA	Rwanda Environmental Management Authority
RIWSP	Rwanda Integrated Water Security Program
RSSP	Rural Sector Support Project
SACCO	Saving and Credit Cooperative
SNC	Second National Communications
SORWATOM	“Société Rwandaise de Tomates”
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
VSLA	Voluntary Savings and Loan Association
VUP	Vision 2020 Umurenge Program
WI	Winrock International
WMO	World Meteorological Organization
WV	World Vision

## **EXECUTIVE SUMMARY**

The Rwanda Integrated Water Security Program (RIWSP) is a consortium of six institutions including Florida International University (FIU) that leads the consortium, CARE International, World Vision, Winrock International, UNESCO-IHE and ICIWaRM. RIWSP, which is IWRM driven, has at its core the objective of supporting communities in vulnerable areas adapting to the impact of climate change, taking into account their vulnerabilities and building on their capacities. The Program will test field approaches in selected watersheds in Rwanda in order to generate replicable approaches for other areas of the country. To this end, up to four watersheds in the sub-basins of Akagera and Akanyaru will be selected. The watershed of Kamababa in the Akagera sub-basin was chosen to start activities. These activities are taking place in the districts of Gatsibo and Kayonza, which are both part of Kamababa watershed, in the Eastern Province of Rwanda.

The components of the RIWSP are designed to support various initiatives in water, agriculture, sanitation and livelihoods, which pertain to the needs of the communities. The program conforms to priorities of the Rwanda Economic Development and Poverty Reduction Strategy (EDPRS) and to the priorities of Rwanda's National Adaptation Plan of Action (NAPA).

CARE as a partner in RIWSP, is charged with providing training in its methodology of Climate Vulnerability and Capacity Analysis (CVCA) and ensuring that the application of the CVCA methods and tools provides valid community-based adaptation strategies for those communities where RIWSP is being implemented. These strategies are to be owned by the communities – an approach consistent with Community-Based Adaptation (CBA) framework.

In view of the above, in July-August 2012, RIWSP carried out CVCA training and the team that was trained was later on the facilitators for conducting climate vulnerability assessment in four communities of Kayonza and Gatsibo district. This provided initial climate change adaptation strategies for the four communities. It also paved the way for more training, more application of the CVCA methodology, the development of more community-based adaptation plans or strategies - owned by communities - within the two target sub-basins of the RIWSP. The training included staff of local and central government as well as RIWSP staff.

This document reports on the application of CVCA in the four demonstration communities (Kageyo and Nyamugali Cells of Mwili sector, Kayonza district, and Munini and Rwikiniro Cells of Rwimbogo sector, Gatsibo district). It also provides a summary of information on climate change impacts in Rwanda and recommends how further adaptation planning can be undertaken with increased effectiveness.

The approach used to conduct the assessments in the four communities was traditional participatory research methods with an applied climate lens. Participants in the assessments included representatives of various villages institutions (VSL group, Vulnerable people, FBO, CBO, CSO, etc) as well as local authorities. The gender aspect was also considered.



Both communities of Mwili and Rwikinero sectors estimated that agricultural land and farms (for livestock) are the most valuable assets they have and drought is considered as the most climate hazard affecting them. Moreover, invasion of wild animals from the National Park is also considered a major problem by the communities since they destroy their houses and crops, especially in Munini and Kageyo cells. Women group of Rwikinero and Munini cells emphasized on the invasion of tsetse fly, which causes sleeping sickness on humans and animal trypanosomiasis on cattle, disease known locally as “Nagana”. Termites, which are destroying the planted trees and houses, and striga infestation, which destroy crops, are also considered as major hazards affecting the communities’ livelihood.

In order to cope with period of drought, communities proposed a combination of rainwater harvesting and small scale irrigation technologies. They have also proposed the construction of crops storing tanks at village level to be used in period of food shortage.

This document reports only on the CVCA effort in four communities in two Sectors of Eastern Province, located within the target watershed of Kamababa. As ‘adaptation is local’, it shows how the tools can be effectively used, but it does not provide adaptation plans for wide application. It also provides a framework for the involvement of all stakeholders, including centralized and decentralized levels of government, in the implementation of adaptation measures through community-based participatory assessment methodologies.

## **1. INTRODUCTION**

### **1.1. RIWSP background information**

The Rwanda Integrated Water Security Program (RIWSP) is a USAID funded Program made of a consortium of implementing partners including Florida International University (FIU) that leads the consortium, CARE International, World Vision, WINROCK International, UNESCO-IHE and ICIWaRM. RIWSP, which is IWRM driven, will test field approaches in selected watersheds in Rwanda in order to generate replicable approaches for other areas of the country. To this end, up to four watersheds in the sub-basins of Akagera and Akanyaru will be selected. The watershed of Kamababa in the Akagera sub-basin was chosen to start activities. These activities are taking place in the districts of Gatsibo and Kayonza, which are both part of Kamababa watershed, in the Eastern Province of Rwanda.

The primary goal of the Rwanda Integrated Water Security Program (RIWSP) is to improve the sustainable management of water quantity and quality to positively impact human health, food security, and resiliency to climate change for vulnerable populations in targeted catchments in Rwanda. It is in this latter aspect, i.e. climate change issues, that a Climate Vulnerability and Capacity Assessment (CVCA) has been conducted in four selected communities of Rwandan Eastern Province, namely: Kageyo and Nyamugali cells of Mwili sector, Kayonza district and Munini and Rwikiniro cells of Rwimbogo cells, Gatsibo district; which correspond to Kamababa watershed.

### **1.2. Introduction to CVCA report**

This document contains a report on the application of CVCA methodology/tools for Rwanda Integrated Water Security Program (RIWSP) in four communities<sup>1</sup> in two Sectors of Kamababa watershed, Akagera sub-basin, in the Eastern Province of Rwanda. The document also includes an analysis of adaptation options for those communities based on outputs from the use of CVCA methodology/tools, as well as lesson learned and recommendation emerging from the work done, and appropriate Annexes.

### **1.3. Objectives**

The general objectives of CVCA in the RIWSP plan of activities are:

- To train local authorities<sup>2</sup>, CBOs, CSOs, members of central government as well as RIWSP staff in the use of CVCA tools which allow them to undertake community-based Climate Vulnerability and Capacity Assessment of a given community, hence replicate the process in other districts
- To facilitate the design of a climate change adaptation strategy including adaptation measures sensitive to the context of climate change and relevant to participating communities in RIWSP's target areas.

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<sup>1</sup> Background information of the four communities can be found in Annex 1

<sup>2</sup> Report on the training is provided as a separate document

The specific objectives of the CVCA in the four selected communities were to develop the capacity of the selected communities to adapt to climate change impacts by:

- Analyzing the vulnerability of their livelihoods to the climate-related challenges they face.
- Helping the communities to understand climate risks and identify the resources available to them to adapt.
- Gathering information to design adaptation strategies.

## **2. METHODOLOGY**

### **2.1. Rationale behind the selection of the two sectors**

In the mandate of RIWSP, its areas of interventions include selected watersheds in the Akagera and Akanyaru sub-basins. In the Akagera sub basin, Kamababa watershed has been selected as pilot for the implementation of RIWSP activities. Kamababa watershed, which is located in the Eastern Province, comprises four districts: Gatsibo, Kayonza, as well as one or two sectors of Ngoma and Nyagatare. Gatsibo and Kayonza being the districts having most of their sectors included in the Kamababa watershed, RIWSP activities are therefore only focused in those two districts.

To emphasize on the integration aspect of RIWSP, it was decided that the CVCA process would be undertaken only in sectors where all three field implementing partners, i.e. World Vision, CARE and Winrock International, have beneficiaries in both districts. After analyzing the preceding, Mwili and Rwimbogo sectors of Kayonza and Gatsibo districts respectively, have been chosen.

### **2.2. Approach used for conducting the CVCA**

Team of facilitators (composed of local and central government staff as well as RIWSP staff) that have been trained<sup>3</sup> in CVCA process, and the consultant who was the trainer, split into two to carry out the assessment: one team went to Mwili sector and the other one to Rwimbogo sector. The approach used for the assessment followed the CVCA approach as laid out in the CVCA Handbook (see reference). Specifically, the approach for conducting CVCA at local government and community level as laid out in the Handbook, pages 16-18, was followed.

The tools used in this approach were traditional participatory research methods with an applied climate lens. The participatory rural assessment (PRA) tools used were as follow:

- Assets and hazard mapping
- Seasonal calendar and historical timeline
- Vulnerability matrix
- Rainbow diagram
- Venn diagram

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<sup>3</sup> See the training report, which is provided as a separate document

These were completed with semi-structured interviews of key informants (such as executive secretaries of the cells, women representing others in the village, elders, etc...) and secondary research data.

### **3. ANALYSIS OF CLIMATE CHANGE VULNERABILITY AND ADAPTATION OPTIONS OF FOUR COMMUNITIES OF KAMABABA WATERSHED**

This chapter provides an initial analysis of data collected during use of the CVCA approach and tools. Details on the CVCA process conducted in the two sectors can be found in Annexes 3 & 4. This chapter provides information on:

- The context for implementing the CVCA process by RIWSP
- The climate change context in Rwanda
- The linkage between climate change and livelihoods
- Climate risks and hazards faced in the communities
- Institutional context for implementing emerging adaptation measures
- Additional analytical information to strengthen the potential for adaptation action

#### **3.1. Some definitions of important Climate Change terms and concepts**

##### **➤ Climate Change**

Any change in climate over time, whether due to natural variability or as a result of human activity.

##### **➤ Community-Based Adaptation**

Community-Based Adaptation (CBA) projects are interventions whose primary objective is to improve the capacity of local communities to adapt to climate change. Effective CBA requires an integrated approach that combines traditional knowledge with innovative strategies that not only address current vulnerabilities, but also build the resilience of people to face new and dynamic challenges. It also aims to protect and sustain the ecosystems that people depend on for their livelihoods

##### **➤ Vulnerability to Climate Change**

The degree to which a system [natural or human] is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity.

##### **➤ Exposure**

Exposure to climate variation is primarily a function of geography. For example, coastal communities will have higher exposure to sea level rise and cyclones, while communities in semi-arid areas may be most exposed to drought.

### ➤ Sensitivity

Sensitivity is the degree to which a given community or ecosystem is affected by climatic stresses. For example, a community dependent on rain-fed agriculture is much more sensitive to changing rainfall patterns than one where mining is the dominant livelihood. Likewise, a fragile, arid or semi-arid ecosystem will be more sensitive than a tropical one to a decrease in rainfall, due to the subsequent impact on water flows.

### ➤ Adaptive Capacity

Adaptive capacity is the ability of a system [human or natural] to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical and financial resources. Examples of resources affecting adaptive capacity include:

<b>Human</b>	Knowledge of climate risks, conservation agriculture skills, good health to enable labor
<b>Social</b>	Women's savings and loans groups, farmer-based organizations, traditional welfare and social support institutions
<b>Physical</b>	Irrigation infrastructure, seed and grain storage facilities
<b>Natural</b>	Reliable water sources, productive land, vegetation and trees
<b>Financial</b>	Micro-insurance, diversified income sources

### Resilience

Resilience can be defined as the ability of a system [human or natural] to resist, absorb and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity.

### Hazard

In the context of disaster risk reduction, a hazard is defined as a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Hazards in the context of this report, refer both to shocks, such as floods (rapid onset), and to stresses, such as droughts or changing rainfall patterns (slow onset).

It is important to distinguish between the hazard (e.g. flood) and the effects of the hazard (e.g. death of livestock.) Some effects, such as food shortages, may be the result of a combination of hazards, including climate shocks and stresses, declining soil fertility and insecure access to markets. To effectively analyze vulnerability, the dynamic nature, causes and interactions of hazards must be understood.

## **Sustainable Livelihoods**

Livelihoods comprise the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from external shocks and stresses, and maintain or enhance its capabilities and assets now and in the future. Five core asset categories are typically identified in the sustainable livelihood: Human, social, physical, natural and financial.

In some livelihoods frameworks, political capital is recognized as a sixth category of resources.

### **3.2. The Climate Change Context in Rwanda**

Information on Rwanda's climate context was accessed from documents available through REMA. This included the Rwanda State of the Environment Report<sup>4</sup> and Rwanda's Second National Communications (SNC) submitted to the UN Framework Convention on Climate Change Secretariat (UNFCCC) on June 5, 2012.

According to the SNC document, climate projections for Rwanda were recently done for the period 2010 -2100 using the 36-years period of 1971-2007, as the baseline. These projections are based on the MAGICC model (model for the assessment of climate change caused by greenhouse gas emissions) that was used to develop climate estimates of Rwanda in relation to the data of that baseline period. Three models (over 17) namely PCM\_00, IAP\_97 and LMD\_98, were found to be most suitable for Rwanda. The SNC includes these projections based on future climate change scenarios:

“All three models predict an average increase in minimum, average and maximum temperatures towards the years 2020-2100. The increase in the annual average maximum temperatures reaches 3.3°C by the end of the century.

For rain, projections show that two models respect the variability of the two wet seasons during the months of March-April-May and September-October-November, but with a growing shift that reaches 50 mm (increased rainfall) in April and December.

Projected mean temperatures are expected to increase for all three models, approximately of about 1.3°C to 1.9°C in 2050 and of 2.3°C to 3.3°C in 2100 above the baseline mean.

For the projected maximum temperature, the 3 GCMs have a similar trend in annual increase in the historical average maximum temperature. The increase in maximum temperature varies from 0.44 to 0.6 in 2020, from 1.3 to 1.9 in 2050, and from 2.5 to 3.3 in 2100, for the three models”.<sup>5</sup>

It would be useful to relate these projections to the work of the IGAD Climate Prediction and Application Centre (ICPAC), the regional climate prediction centre of the World Meteorological Organization (WMO) based in Nairobi. While long-term predictions are useful and provide a basis for action, also relevant are seasonal forecasts that make climate

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<sup>4</sup> See chapter 9 of that Report

<sup>5</sup> The climate scenarios were produced by “Service Météorologique National”/MININFRA.

prediction more immediate, relatively speaking. The above mid-century prediction of an increase in temperature of approximately 1.6 degrees is additional to a 0.9 degree change observed in Kigali over the last 27 years. These numbers are a call for action on adaptation so that the human, economic social and ecological systems of Rwanda are not stressed to the breaking point. The Intergovernmental Panel on Climate Change (IPCC) projections in their forthcoming report will provide more information on both global and regional trends and policy implications.

According to MINIRENA (2009), cited in the Rwanda Second National Communication under the UNFCCC, though the Eastern Province has the third highest accessibility to potable drinking water (73% of its population)<sup>6</sup> out of five provinces of Rwanda, it is nevertheless the last in per capita consumption per day (only 30.9 l/c/d, while the national average is 54.7 l/c/d). This reflects the fact that the Eastern Province is the largest and most populated region, while also being the most arid.

Given the above figures, Kamababa watershed, which is located in the Eastern Province, is expected to become more and more vulnerable to the impact of climate change, which in this region means more severe droughts, hence increased water scarcity.

Community observations on climate change are not included in the SNC but communities do have historical knowledge of climate change and its impact, and good knowledge of trends up to the present. As well, communities have experienced climate shocks and other events as well as with long terms change. Their skills and knowledge of coping strategies and their knowledge of vulnerabilities with regards to their resources and livelihoods in the context of climate and other environmental change are a key resource for adaptation.

Here is an historical time-line from one of the Cells where RIWSP carried out the CVCA. It indicates community observations of significant climate hazard events, and/or consequences of those hazards, which goes back 40 years:

**Table 1: Historical timeline of Nyamugali cell**

YEAR	EVENT
1973	Famine
1973 – 1976	Malaria Heavy rains
1978	Rwakagungu <sup>7</sup> famine Plants disease affecting sweet potatoes
1982	Rwambaraje <sup>8</sup> famine Hail stones
1987 – 1988	Famine (Ntuntire akayungiro <sup>9</sup> )
1991 – 1994	Famine (Rusambura amabati) Drought
1995	Poultry disease

<sup>6</sup> This data are not consistent with the recent EICV3, which stipulates that “Eastern Province has the lowest percentage of households using an improved source of drinking water (67%) and a high percentage of households using (unsafe) surface water relative to other provinces”

<sup>7</sup> Rwakagungu famine: was caused by caterpillars attacking sweet potatoes

<sup>8</sup> Rwambarage famine: Comes from the French word “emballage”, means small plastics bags used to carry provisions (food stuff). Emballage famine is referred to the plastic bag used to carry provision which is not common in rural area.

<sup>9</sup> Ntuntire akayungiro: Don’t borrow my sieve. During the famine period, household used to consume cassava bread. And the sieve is always on use.

1996 – 1997	Famine (Ntuntire agafuni) Drought
1998	Caterpillar infestation Diarrhea
1999 – 2000	Drought Famine
2002	Meningitis
2004 – 2008	Drought Famine (Kinga umwuzukuru araje)
2009	Striga infestation
2010 – 2012	Termite Wild animals (from the National Park) attacks Diarrhea

Although some of the disasters listed in the above historical timeline developed by local communities are not direct impacts of climate change, their increase in frequency and magnitude are certainly caused by climatic stress. As described in the “Guidelines for mainstreaming climate change adaptation and mitigation in the health sector”, REMA (2010), the extreme weather events (high temperatures, drought, floods, heavy erratic rains, humidity) will affect Rwanda’s health system in a number of ways:

- Vector-transmissible diseases will be more frequent and geographically widespread as a result of global warming
- Scenario analysis indicates that potential increase in water related epidemics could range from 12% to 27% for malaria
- The incidence of infectious related diseases already responsible for most epidemics are also likely to increase with rising temperature
- Efforts to combat HIV/AIDS could suffer setbacks if patients are exposed to food shortage and malnutrition due to more severe drought, which is the main impact of climate change in the four communities assessed in this report.
- Respiratory tract infections, cholera and dysentery outbreaks are increasing, especially among children of ages five and under, and among women.

The incidence of some diseases in the assessed communities is being exacerbated by climate stressors; likewise, the intrusion of wild animals from the National Park into the surrounding villages could also be attributed to climate change. In fact, the severity of drought in the concerned areas results in water and food scarcity in the Park, thus wild animals tend to move out of their natural living perimeter to look for water and food in the neighboring communities’ crop fields.

The goal of the Rwanda Integrated Water Security Program is to improve the sustainable management of water quantity and quality to positively impact human health, food security, and resiliency with respect to climate change to benefit the vulnerable population. To this end, various interventions of the Program activities have been working to reduce the vulnerability of the population of the Kamababa watershed, more specifically in the Kageyo,



Nyamugali, Munini and Rwikinero cells to the direct and indirect impacts of climate change, as stated above, by having a watershed approach:

- The MUS (multiple use water service) will help local communities to have water security for drinking and productive use (food security) through rainwater harvesting and/or gravitational water supply from springs while at the same time protecting the springs.
- Promotion of small-scale irrigation techniques that are water-efficient, hence climate resilience
- Promotion of appropriate sanitation, such as ECOSAN, that employs dry toilets, a good way of coping with water scarcity of the area while at the same time improving sanitation of local populations
- The behavior change promoted by the Program will help decrease the incidence of various illnesses.

Moreover, RIWSP will provide specific tailor made products, such as Meteorological Atlas, to better estimate and consider climatic variations and to be used as tools in the decision making process of the water sector. It should be noted that all RIWSP activities are performed in an integrated way, and are complementary to each other.

### **3.3. Climate Change Policy Context**

Currently, climate change adaptation planning is done centrally and does not appear to have been informed by the experience of community-based adaptation. Hopefully activities under the RIWSP project will be able to change this in some way.

The Adaptation section of the SNC (Chapter 4) includes a sectoral assessment focusing on Water, Agricultural, Forestry and Health in the context of Rwanda's national economy. All these assessments can be fed by information on community realities. However for the purposes of the CVCA, the SNC was reviewed for the applicable parts on climate change.

The action plan for the implementation of adaptation measures in the water resources sector in Rwanda is of particular interest to RIWSP. Future plans are set out and include 15 objectives that can be relevant to community-based adaptation if implemented in cooperation with communities and where communities have done their own assessment of their vulnerabilities and capacities (**See the relevant extract on water resources in Annex 5**).

Discussions with REMA's new coordinator for adaptation provided information that Rwanda will likely not seek to have its own Climate Change Policy, but will work within the framework of the East Africa Community Climate Change Regional Policy. Rwanda's future climate change programs and initiatives would fit within that policy framework. It is significant to understand how the regional policy will become meaningful in Rwanda in particular in the context of decentralization. From the perspective of RIWSP, its very foundation lies in the work that went into the development in 2005-06 of Rwanda's National Adaptation Plan of Action (NAPA) and the country's Economic Development and Poverty Reduction Strategy (EDPRS), which has been revised over the years.

In Rwanda, the use of community-based approaches is new and it has been included in the design of the RIWSP project. The vision is that work needs to start on a suitable scale, in the

most vulnerable river basins, dealing with a key aspect of how climate change affects lives and livelihoods, which is primarily in the water sector but integrated to include agriculture, livelihoods, health and sanitation. Further the vision was to respond to Rwanda's initial assessments of its adaptation requirements laid out in 2006 with the preparation of its Nation Adaptation Plan of Action (NAPA). In that rapid assessment, work on integrated water resources management (IWRM) was set out as the top priority area for action.

The NAPA-Rwanda report, which has been developed by a team of six experts from various governmental institutions<sup>10</sup>, has identified eleven (11) priority options in order for Rwanda to adapt to the impacts of climate change. Those priority options were formulated in a way to adequately respond to most immediate and urgent needs of most poor local communities, hence, most vulnerable in socio-economic and climatic point of view. Among those eleven priorities, NAPA selected six as high priority options:

Priority n° 1: Integrated water resources management (IWRM)

Priority n° 2: Set up information systems of hydro agrometeorologic early warning system and rapid intervention

Priority n° 3: Promotion of income generating activities

Priority n° 4: Promotion of intensive agriculture and animal husbandry

Priority n° 5: Introduction of varieties resisting to environmental conditions

Priority n° 6: Development of energy sources alternative to firewood

With the intersection of the prevailing national priority, the RIWSP approach to community-based adaptation, the opportunity exists for innovative action, engagement with the population and local authorities, the potential for new learning and a relevance that fits well with current thinking on best practices for effective adaptation.

The CVCA approach does not undertake to make climate projections or predict climate events. However it is a fair assumption that there will be a continuation of events, hazards and variability and there will be an increase in variability, also, some events will be more extreme or more frequent. This is an important statement. It must be reiterated that the CVCA study will not yield predictions on climate change in the future in terms of rainfall amount, frequency and severity of rainstorms, change in temperature in terms of degrees, number of heat days in a year, the extent of variance for rainfall start days, the evapo-transpiration rate, etc. But this is not a barrier to adaptation planning. What is important is the experience of people in terms of the trends they see in climate variability and the frequency and severity of events. This is valid information and accurate for their locale. It is what informs them and provides them with an assessment of their situation. This experience is a significant asset in terms of local adaptive capacity and compliments their other assets, capacities and institutional arrangements.

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<sup>10</sup> This team comprises:

- NAPA national project coordinator,
- UNFCCC Focal Point and Director within Rwanda Environment Management Authority (REMA),
- Environment programs representative in the Ministry of Lands, Environment, Forestry, Water and Mines (MINITERE),
- Environment Focal Point in the development planning unit / Ministry of Finance and Economic Planning (MINECOFIN), and
- The Director of Lands and Environment in the Prime Minister's office.

### 3.4. Livelihoods and Climate Change Relationship

The perspective inherent in the CVCA approach is that these assets – combined with the experience and capabilities of the communities as well as the organizations at the community level – form a key part of the adaptive capacity and are critical in adaptation. These are supported by the institution's functions, especially those of the various levels of government but also those of society and culture. Among the government functions are programs, resources and other deliverables as well as those of planning, monitoring and measurement, and science. These elements of adaptive capacity must be understood and used to tackle climate change hazards, events, long-term trends and also to tackle vulnerability drivers which operate within communities and assist in maintaining the cycle of poverty. By tackling climate hazards and vulnerability drivers, adaptation efforts seek to support community livelihoods and must show results in terms of community livelihoods and in many cases also show results in terms of the natural resources and the ecological assets, often referred to as ecological services (WRI, 2011). This is captured in the following chart:

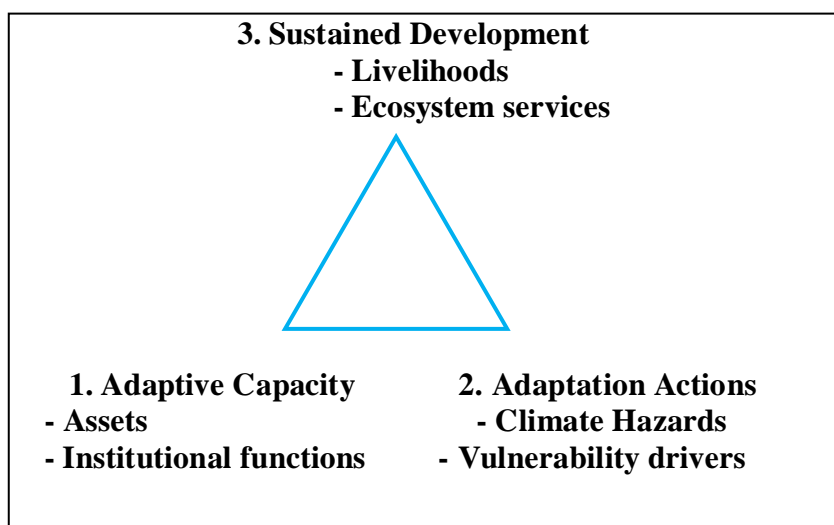


Figure 1: Livelihood & climate change relationship

Livelihood resources are divided into five categories: natural, physical, financial, human and social. The definitions for these categories are:

- **Natural resources:** The natural resource stock upon which people rely both directly (i.e. for income or medicine) or indirectly (i.e. flood control, protection from storms).
- **Physical resources:** The basic infrastructure and productive capital for transport, buildings, water management, energy and communications.
- **Financial resources:** The stocks and flows of money that allow people to achieve their livelihood objectives.
- **Human resources:** The skills, knowledge, capacity and good health important to the pursuit of livelihoods.

- **Social resources:** the formal and informal social relationships and institutions from which people draw in pursuit of their livelihoods

From the use of CVCA tools and community discussions in the 4 cells, community members identified the following key livelihood assets

**Nyamugali mixed groups** listed these assets: land, marshlands, valleys, roads, churches, schools, health center, forests, electricity, water, market centers, water sources, bridges, farms, minerals, tree nurseries, wells, offices of the cell, offices of the cooperative

**Kageyo mixed groups** listed these assets: land, marshlands, valleys, roads, churches, schools, health center, forests, house, livestock, beekeeping, dairy, lake (Ihema), settlement, boreholes, valley dams, trade centers, water sources, bridges, farms, minerals, tree nurseries, wells, offices of the cell, offices of the cooperative, Akagera national park, women's handcraft

**Rwinkiro Mixed Group** listed these assets: forest, electricity pole but no power yet, roads, water point (well), local authority office/2 village offices, school, mosque, church, health centre, trade centre, telecommunication antenna, dairy farm, rice field (marsh land), bees, cow market, valley dam, cash crops (maize field, banana field), quarry, livestock farms, bee-keeping

**Rwinkiro Women's' Group** listed these assets: trade centre, water point (but dysfunctional), church, mosque, banana field, forest, health centre, marsh lands, dairy farms, cow market, local authority office, schools, farm land, valley dam, water tank

**Munini Men's group** listed these assets: crop land, schools, roads, valley dam, farms, trade centre, banana field, water (surface water, dams, wells, and valley streams, ground water, boreholes), maize field, church, planted forest, electrical poles, swamp/ marsh lands, cell office, bridges, quarry.

Three stories from the communities that illustrate a strong desire for support in undertaking adaptation measures:

1. People in one community are eager for permission to plant cassava and sweet potato as their back-up crop even while they plant maize and sorghum to conform with national agricultural food security directives; local food security considerations suggest that planting cassava and sweet potato mixed with maize and sorghum conform with local knowledge on how to prepare for food shortages in long dry seasons.
2. People in one community have storage facilities for locally harvested food in the cooperative. However it costs them a lot of money and they lose control of the management over their stored food reserves. The storage is costly and the cooperative has to pay someone to manage/guard the food storage facility.
3. One rice-growing community faces a problem with a rice disease that can be overcome if the rice is planted in a coordinated way - with canalization of water

for access to water for all farmers at the same time. Liaison with Rural Sector Support Program and COPRORIZ is crucial to do this. The farmers have a solution but need the attention and support of larger agencies.

### 3.5. Changing Climate and Disaster Risks

The CVCA tools asked participants to map the communities – calling it a Hazard Map, which became really a Livelihood Assets and Hazards map.



Figure 2: Kageyo cell hazard map

Participants were later asked to develop list of Hazards and Livelihood assets and were then asked to rank them in terms of the greatest hazards and the most valuable assets. A critical task was to choose priority hazards and priority assets and assess the impact of the hazards on the assets. This results on what is called a vulnerability matrix. Details on the index compiled for these maps for the four cells are found in the two CVCA Sector Reports, Annex 3 and 4.



**Figure 3: Women of Munini cell completing the vulnerability matrix of their cell**

### 3.6. Institutions Context related to Climate Change

Rural livelihoods are supported by a range of institutions. The team has undertaken to compile information on institutions that play a role in the lives of the two sectors, including international donors and NGOs and programs of the national government, as well as district sector and cell institutions, agencies and programs, plus institutions that operate at the cell and village level. It is an impressive list. Community members requested to assess the influence of various institutions in terms of assisting with the implementation of adaptation measures and to support their livelihoods against risks and events. The following outputs were derived from the CVCA inquires with regard to institutions supporting adaptation:

**Table 2: institutions ranking (Venn diagram), Nyamugali cell**

Highest	Medium	Lowest
Schools, Mutuelle de santé, Red Cross, VUP, Health centers, Cell, RDB, RSSP, Farmers cooperatives, bee keepers cooperatives	MINALOC, Sector, District, Province, SACCO, ADRA, EWSA, Partners in health, BTC, WFP, RIWSP, Global Fund, SORWATOM, Compassion	Mining, NCA, FARG, RAB, RDF

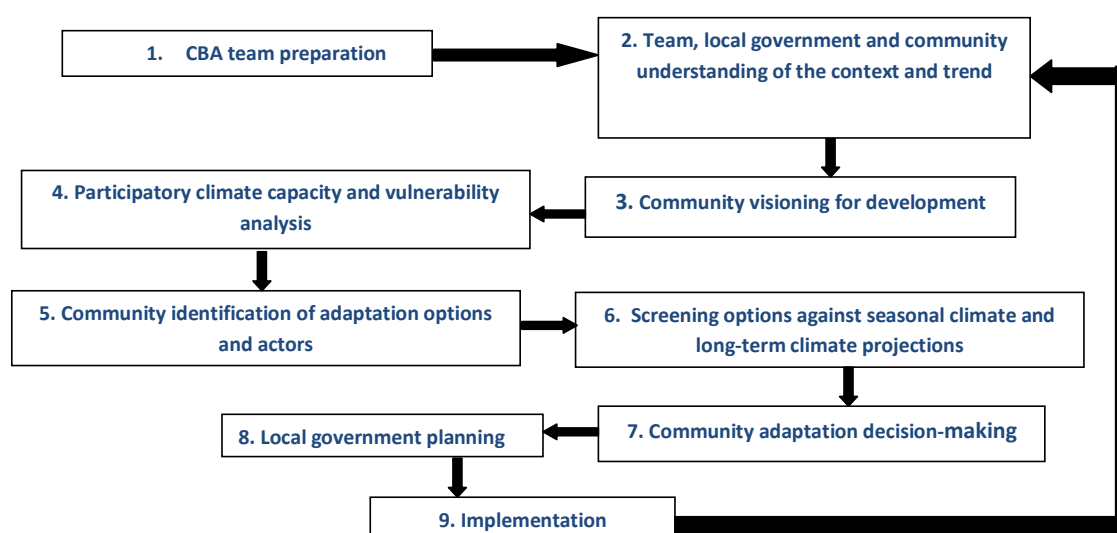
**Table 3: Institutions ranking, Kageyo cell**

Highest	Medium	Lowest
Cell authorities, KAPECO, Village authorities, Conciliators, VUP, UMOJA, Farmers cooperative, community health workers, bee-keepers cooperative, Inkeragutabara, VSL groups, RDB, National women council,	New Life Ministries, Compassion, Prison fellowship, Caritas, CARE, URUGO RW'AMAHORO, ARBEF, health centers, TWITEGANYIRIZE, RIWSP, FBO.	Mining, RWARRI, FARG, District, Province, FPR, RDF, MINAGRI, RSSP, EWSA, Red Cross, ADRA.

A key institution in both Sectors is the office of the Executive secretary of the Sector. Discussions were held with the Executive secretaries of the two Sectors involved in the CVCA assessments. They are eager to know about priority adaptation measures emerging from the CVCA process and they are eager to include in their annual performance contract some of the adaptation measures that people in the cells want to see.

The CVCA ‘bottom up’ approach to articulating village priorities and program suggestions is somewhat novel and provides the Sector with information not otherwise available. The Sector officials will be able to integrate Sector plans with those of RIWSP, specifically the adaptation measures, as well as to draw down known District and National programs and support.

Below is a graphic representation of the community-based adaptation planning process:



Among the key agricultural institutions is the cooperative that supports the marketing of agricultural production, which supports farmers with inputs. The relationship between the cooperative and with the community is complex. Often farmers sell their products to the cooperatives (or private black market traders) as they need cash resources. When there is a household food deficit the family has no reserves or stored harvest to draw on. Will the cooperatives assist and support the construction and maintenance of grain storage units at household level as has been proposed? Will the cooperative supply fast maturing and drought resistant seeds? The same question applies to the Ministry of Agriculture. Will both institutions support a food security strategy for the Sector, the cell and households if the planned local activities do not conform to national guidelines and annual production directives?

The draft adaptation measures and plans are provided in this report. These plans or strategies need additional work to cost them out, plan out their implementation, secure local government (Sector) buy-in and inclusion of the measures in the Sector’s Executive Secretary’s performance contract. They must remain ‘living documents’ as they will change



over time. More specifics and details will certainly need to be added to them. But it is most important that these plans are taken up by agencies with resources to support communities.

### **3.7. From CVCA assessments to Adaptation plans**

The CVCA tools used in the assessments are designed to assist the community to come up with priority measures for adaptation upon which they agree – measures that the community understands to be a set of responses to climate hazards they face and the vulnerability of the community. Like all good development and emergency response programs, these measures must build on the capacities and experience of the people while aiming to reduce the vulnerabilities they understand to be a threat – current or future – to their livelihoods. The change theory implicitly involved here is that the community is willing and – to a degree – able to contribute their time and resources – while maintaining community ownership of the adaptation measures so that the community’s adaptive capacity increases.

Adaptation measures are community (cell) specific, and priorities are assessed and set at community (cell) level. Patterns may emerge across several CVCA assessments that may give pause to those doing central Agency and District planning to reconsider their plan so that they take into account the local assessment and articulation of necessary measures, strategies, and requirements.

The merging adaptation action plan requires clear objectives. Its measures must be clearly targeted. It must originate in the CVCA analysis of community vulnerability and capacities. It must deal with specific identified and prioritized vulnerabilities.

The community may come to view this as their **Community Adaptation Action Plan**. This is a good thing. Ownership of the Adaptation Plan and the information that backs it up is a desired outcome of the CVCA process.

The production of this draft plan is the last output from the CVCA process guided by the CVCA Handbook. The follow-on stages concern the integrating adaptation measures into development projects.

By having followed the CVCA system one can say that the outcomes have validity, integrity and ownership. These attributes are derived from the process and the source of the data – the community members whose lives are involved in the day-to-day activity of surviving and making a livelihood for themselves in the respective communities. The need for specificity is a longer process involving the implementation partners in assessing the measures as set out below. Once the adaptation plans reaches an acceptable level of specificity, it can be regarded as a completed plan. Beyond that it moves into the implementation phase.

Following the listing of priority adaptation measures by communities, the measures were inserted into a chart where each of them could be expanded, hence lead to the development of the skeleton of an adaptation plan. This chart has several columns, which allow for data collected in the CVA process to be inserted and with additional community input, the columns could be completed. This plan can then be a fuller explanation to development agency staff about what is envisioned for the community. Various follow-up steps could then be carried out, but at least the communities ideas about adaptation measures are



presented in a clear way. Below is a partial section of such a chart. The charts completed by the communities of the four cells can be found in Annex 7.

**Table 4: Example of an Adaptation Plan<sup>11</sup>**

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long term Benefits	Target	Indicator	Cost	Responsible institutions
Improve forest management	Deforestation	Reduce illegal cutting in defined or plantation areas	F=High I=High	Government inventory of forest cover and	Set up monitoring system, set penalties, conduct awareness campaign, find alternative fuel source, get District & Sector support	Maintain trees for shade and soil stability	Forests maintained, forest loss reduction	To be set	# of hectares with low loss of tree	To be calculated	Winrock, plant trees on water recharge lands; CARE/WI dialogue with Districts & Sectors

<sup>11</sup> Please note that the headings of the columns of the Adaptation plan can change. However, the following columns could be considered as crucial for any climate assessment adaptation plan: adaptation measure and its corresponding hazards, target, indicator, cost and the responsible entity.

### 3.8. Follow-up

Adaptation measures suggested in the Adaptation Plan now need to be analyzed on several additional parameters, including:

- Cost requirements
- Feasibility
- Technical requirements
- Technical assistance
- Training requirements in the community
- Appropriate timing or scheduling – with some adaptation measures applied as early as possible (i.e. early action) to ensure the credibility of the partners and CVCA process
- Availability of financial and Program resources to respond to, and
- Other parameters as appropriate

Appropriate roles of stakeholders and supportive institutions now need to be determined to assist with implementation of the plans, including:

- Integration of the Adaptation Plan and measures into the activity plans of RIWSP for action by RIWSP partners within their current programs and obligations
- Ministerial responsibilities at Central level
- District and Sector level responsibilities
- Other actors and agencies

Adaptation measures suggested by the community now need to be implemented mainly by:

- Stakeholders and other institutions plus the community - through a **Joint Action Plan**. This includes a key role for RIWSP partners
- Appropriate programs of central Ministries and government agencies, Especially those available at District and Sector level
- Other appropriate stakeholders, institutions and agencies outside of the cell and Sector, recognizing that advocacy may be required by RIWSP and other appropriate voices to ensure these groups take appropriate action

RIWSP partners will now ensure **well-coordinated and active communications** with the communities on Adaptation Plans and measures including reporting from RIWSP partners and the involvement of community implementing committees<sup>12</sup> as focal points.

RIWSP partners will support **monitoring by local communities** of the Joint Action Plan related to the priority adaptation and vulnerability (risk) reduction measures, and to bring new information into the plan as soon as it is available in case amendments are needed to the plans – so that they are living documents.

Stakeholders, including community leaders, RIWSP partners and other institutions should agree on a **monitoring plan** related to the Joint Action Plan that will operate for the next 3-4 years of RIWSP activities.

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<sup>12</sup> Community implementing committees: are follow up committees elected by the communities at cell level composed by three to five committee members.

Another follow up activity that will likely emerge from this CVCA study is looking at how the available grants of the Program will assist the existing legal entities, such as farmer cooperatives, water users associations, etc of Mwiri and Rwimbogo sectors, in achieving priority adaptation measures that have been identified during the assessments.

An excellent **reporting and documentation** system must be maintained: The climate change adaptation initiatives under RIWSP are innovative, they are prototypes for Rwanda and potentially they can be scaled-up or replicated. Thus the experience needs to be recorded and available to many organizations and authorities in Rwanda and internationally. Rwanda is eligible for adaptation resources over the coming years from many sources of funds for adaptation and its record of experience with adaptation should build the foundation and the credibility to access such funding. The documentation and records should include evaluations and lessons learned.

#### 4. RECOMMENDATIONS

From the above work, few recommendations that are critical to the RIWSP going forward have emerged:

**a) Adaptation measures based on the application of CVCA should be integrated into the work plans of RIWSP components.** For instance, recommendations from the Climate Vulnerability and Capacity Assessment (CVCA) process and the resulting adaptation plan should provide information to the MUS activities on the appropriate technologies to respond to the identified needs and vulnerabilities, thus improving the livelihoods of the targeted communities. Taking into consideration the adaptation plan developed by local communities during the CVCA process will ensure the integration of the Program activities and its sustainability.

Community-specific adaptation plans for the four Cells in the target Sectors of Akagera sub-basin are the outputs from the application of the CVCA methodology. The plans that were developed during this work should receive the proper and supportive follow-up they deserve. The adaptation plans need to be reviewed, for costs, checked for feasibility. As the CVCA process is ongoing and participatory, people in the communities should remain involved in the evolution of their adaptation strategies, and in implementing and monitoring their plans. They should also be able to see action on some aspect of their plans in the near term. Advocacy should be undertaken to see these adaptation plans integrated into the Sector performance plans. To integrate adaptation measure into Sector plans, RIWSP governance staff should remain integral to the adaptation planning process. Also, key messages need to be articulated for the community-based advocacy to the Sector and district officials.

**b) Develop a Join Monitoring Plan including RIWSP and relevant Sectors.** Stakeholders, including community leaders, Sector officials, RIWSP partners and other institutions should agree on a participatory monitoring plan related to the Joint Action Plan for Adaptation that should operate during the next four years of RIWSP activities.

**c) Adopt the amended set of CVCA tools and approaches to ensure strong adaptation plans.** To overcome limitations encountered in the CVCA process, the tools used in the training undertaken under this consultancy should be adapted in the application of CVCA in other communities. Improvements such as the 'Rainbow diagram' and the adaptation plan format will strengthen the CVCA and ensure a higher-level validity for the CVCA report. Focus Group Discussions and Key Informant interviews also should be used appropriately on communities so that the people involved are different from those who involved in the CVCA community-based participatory process.

**g) Develop and maintain an excellent reporting system on climate change adaptation.** The climate change adaptation initiatives under RIWSP are innovative, they are prototypes for Rwanda and potentially they can be scaled-up or replicated. The reporting of the use and effectiveness of CVCA and community based adaptation needs to be well documented. Thus the experience needs to be recorded and available to many organizations and authorities in Rwanda and internationally. Rwanda is eligible for adaptation resources over the coming years from many sources of funds for adaptation and its record of experience with adaptation should build the foundation and the credibility to access such funding.

**i) Strengthen each community's own adaptation implementation committee.** More planning was needed and will be needed in the future to strengthen the adaptation

implementation committee. This should include a stronger effort to determine and confirm the mandate of the adaptation implementing committees that were set-up in the target Cells and Sectors.

**k) Develop and implement an effective media strategy to support adaptation efforts.**

While a full media strategy might be ideal and advisable, it may be more than can be managed in the short term. Instead, a specific and focused media strategy should be developed and implemented for the areas or communities under RIWSP mandate. Specifically, a media strategy with targeted radio broadcasts to small holder farmers to compliment the effort to implement community-based climate change adaptation plans and measurers that have emerged from the CVCA efforts is recommended. This media strategy should expand as more adaptation plans are developed as a result of more communities becoming engaged in CVCA and adaptation planning in both Akagera and later in Akanyaru sub-basins.

**l) Engage REMA in the integration of adaptation efforts into Sector and District Plans.**

REMA has expressed a strong interest in knowing more about the validity of community-based adaptation plans, the strength of the CVCA and adaptation planning processes, the role REMA itself can play to facilitating the integration of adaptation efforts into District plans and finding ways to accumulate lessons learning and indeed the data into the national level adaptation planning process.

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## **ANNEXES**

### **ANNEX 1: *Basic information on the four target cells***<sup>13</sup>

#### **Mwili Sector - Village Information Summary**

##### **Village information& Administration**

Kageyo and Nyamugali are two of the four cells of Mwili sector, Kayonza District, Eastern Province. Both cells share borders with Akagera National Park and according to the administrative subdivision, they all have 7 villages.

The cell leadership is composed of the cell executive secretary assisted by in charge of social affairs. The social affairs services available in two cells are as follow: in Nyamugali there is a health post, Gasarabwayi primary school, and Nyamugali secondary school while in Kageyo there is one primary school. In these two cells, the majority of the population lives in agglomerations at the rate of more than 90%. The livelihood in both cells is composed of agriculture, cattle breeding, small animal breeding like hens, goats, pigs and others. In Nyamugali cells there is a market of agriculture products, trade centre.

##### **Cell statistics**

The population of Nyamugali is 8773 people while for Kageyo is 5400.

In both cells, the population practices mainly agriculture, cattle breeding and some of them do some small trade related businesses.

##### **Land and Food Security**

The cells Kageyo and Nyamugali are very wide compared to other cells as they share frontiers with the National Park. Farming activities are promoted with zero grazing policy and the trade of cattle products like milk makes part of their sources of income.

Deforestation is caused by firewood collectors and charcoal making; the pastoralist zone in some areas are overgrazing. In Nyamugali, they tried to invest in fish keeping (fishpond) but the project failed because of the environmental patterns of the areas. Among other agricultural products produced, there are: maize, banana, cassava, beans, soya, and vegetables.

According to land policy, both cells are progressively implementing land reform and land use consolidation. There is a problem of termites, which endangers tree plantation.

##### **Energy use**

The majority of households use woods in cooking meals, some of them have improved stoves, and few of them use charcoal. They collect firewood in their forest but also in the nearby places of the National Park.

##### **Forestry**

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<sup>13</sup> Source of data: respective districts, sectors and cells where CVCA has been conducted

Apart from the National Park, which is close, they planted over the years different species of trees including those that can be mixed with other crops (Agroforestry).

### **Fishery**

This activity is set to be promoted through valley dams as there are no lakes around.

### **Wildlife**

Both cells share frontiers with Akagera National Park, and face the incursion of buffalos, which are somehow a threat to the security of the inhabitants of those cells.

### **Water**

Water is a very crucial problem in the two Cells, especially in Kageyo which was formerly part of the national park. Only one borehole is still functioning in Kageyo, supplying the whole cell with drinking water. Nyamugali cell has a piped water supply system; however the supply does not satisfy the demand and most of water points need to be repaired.

### **Assets and savings**

The important assets are land, cows and their financial savings, which help the population to access loans and start small scale businesses.

### **Social structures, infrastructures and organizations**

Kageyo and Nyamugali cells inhabitants are mixed with returnees from Tanzania and other coming from other parts of the country (internal migration). Regarding transport, there is a network of roads that are practical and help the population to take their production to market. Small trade centers help these communities to exchange in selling and buying what they need as necessities.

### **Hazards, Historical information and Migration Pattern**

The major problem in both cells is that as they all practice rain fed agriculture, the change in rain pattern highly affects their productivity due to longer period of sun and shorter period of rain. When these problems happen, men are those who migrate most.

### **Weather Patterns Scenarios**

Mainly the weather is very hot compared to the rest of Rwanda. The rain periods are November, December and January and the great rain comes during the period of March to May.

### **Information about Resources and division of labor**

Men and women seem to share household tasks including in agriculture activities.

### **Local experts, social aggregator, decision makers, influential persons**

Local experts are sector staff including agronomist, veterinarians, executive secretary and other staff from the district.

There are also some experts implementing development projects funded by the government or local and international organizations. Among the influential persons there are traders representatives, presidents of cooperatives, schools headmasters etc.

## **Rwimbogo Sector - Village Information Summary**

### **Village information& Administration**

Munini and Rwikiniro are two cells in Rwimbogo sector of Gatsibo District, which is located in the Eastern Province of Rwanda, in Kamababa watershed. Munini is about 12 km from the main road and is bordering with Akagera National Park while Rwikiniro is about 7 km from the main road. According to the administrative subdivision, Munini is divided into 9 villages while Rwikiniro is divided into 12 villages. Both cells were established in ancient reserve of Akagera National, where the settlement of people started in 1997 mainly by the returnees who fled the country 1959, and they were joined by other landless people from the countryside of Rwanda.

The leaders found in the cell are cell executive secretary assisted by the in charge of social affairs.

The social affairs services available in two cells are as follow: in Rwikiniro there is one Health Centre and a Primary School - while in Munini there is one complete Primary School (Nine years Basic Education).

Because of bordering with national park, the inhabitants of Munini cells are facing every time the problem of elephants, buffalos and hippopotamuses which invade community lands and destroy crops and sometimes endanger the lives of people.

The livelihood in Munini is mainly made of agriculture, grazing, some livestock in household like chickens, goats, pigs and others. In Rwikiniro cells there is a market of agriculture products, commercial centre.

### **Cell statistics**

The population of Rwikiniro is composed by 2138 households with a total population of 9648 people, of which 4363 males and 5285 females. Among these people, a total of 475 people with 217 males and 258 females are illiterate.

The population of Munini is composed by 1288 households with a total population of 4449 people, of which 2039 males and 2410 females. Among these people, a total of 1681 people with 860 males and 821 females are illiterate.

The population of Munini practices mainly agriculture, and grazing in arid zone where water can only be found in a valley dams located near the cell.

### **Land and Food Security**

The cells of Munini and Rwikiniro are very wide compare to other cells of Rwimbogo sector. There are both new settlements which are mainly inhabited by returnees from Tanzania. In both cells, there is a high rate of deforestation due to firewood collection. The pastoralist zones in some areas are overgrazing. In Rwikiniro cell, they tried to invest in fishponds but the project failed because of the environmental patterns of the areas. Both villages grow banana, maize, cassava, beans and sorghum.

According to land policy, both cells are progressively implementing land reform and land consolidation. The maize is the main crop identified by people to be grown in the region.

### **Energy use**

The majority of households use firewood in cooking meals, but few of them use charcoal. They collect fire woods in ancient zone of National Park.

## **Forestry**

Apart from the forest of ancient zone of National Park, people tried to plant some tree species which friendly grow with crops. Termites destroyed the planted tree in the zone so that the success doesn't exceed 40 percent.

## **Fisheries**

The activity is done in the valley dams in Munini Cell. But in Rwikiniro Cell, the activity failed because the fishponds didn't resist the long period of sun.

## **Wildlife**

The two cells of Rwimbogo Sector are bordering with Akagera National Park. Population of those two cells (Munini and Rwikiniro) is threatened by buffalos, hippopotamuses and elephants, which sometimes destroy their crops and endanger their life. People also go in National Park to look for trees to build house, to collect firewood and for grazing.

## **Water**

Water is a scarce resource in both cells. Munini and Rwikiniro have some valleys dams and boreholes.

## **Assets and savings**

The important assets of people are land and cows; their savings are kept in SACCO Rwimbogo. Savings cooperatives have strong support from the government in terms of mobilization and awareness.

## **Social structures, infrastructures and organizations**

As noted above, Munini and Rwikiniro are new settlements. They are populated by returnees from neighboring countries, some landless coming from the Northern Province and a few number from the rest of the country.

There is a practicable road from the main road Kayonza-Kagitumba, which crosses Rwimbogo sector office, passes through Rwikiniro cell and reaches Munini cell. There is a market in Rwikiniro which was still under construction when this report was elaborated, a health centre, schools, a milk collection centre and valley dams which collect rainfall water for livestock. The main socio-economic activities in both cells are agriculture and livestock keeping. The main crops are maize, cassavas, bananas, peanuts and onions.

## **Weather Patterns Scenarios**

In general, the weather in this area is warmer than the rest of Rwanda. There are two rain seasons: from November to January and from March to May.

## **Information about Resources and division of labor**

Men and women seem to do same job in agriculture. However, men are the ones involved in grazing areas located in the forest where they can spend a long time without coming back in

the community. The market for crops is organized once a week and the Umuganda (which is a community work) is organized at the end of each month.

Pastoralist have their own market where they come to sell cows, a market mainly dominated by men.

### **Local influential persons**

Local influential persons are: sector staff including agronomist, veterinarians, executive secretary and other local staff like in health centre and district staff.

Experts implementing development projects and presidents of cooperatives in agriculture and livestock, as well as businessmen are also influents.

**ANNEX 2: Participants to the introductory meetings**

		<b>Rwinkiro</b>	<b>Munini</b>	<b>Nyamugari</b>	<b>Kageyo</b>	<b>Total</b>
1	Advisory village committee	24	16	14	14	68
2	Beekeeping cooperative	1	1	1	1	4
3	Agricultural cooperative	4	4	4	4	16
4	Livestock cooperative	4	4	4	4	16
5	FBOs	3	3	3	3	12
6	Executive secretary and his IDP	2	2	2	2	8
7	Water users representatives	2	2	2	2	8
8	Environmental committees	3	3	3	3	12
9	Water technicians	1	1	1	1	4
10	CHWs (1 woman & 1 man/cell)	2	2	2	2	8
11	Model farmers	2	2	2	2	8
12	National Women Council at cell level	2	2	2	2	8
13	National Youth committees at cell level	2	2	2	2	8
14	Teachers representatives (Directors)	2	2	2	2	8
15	Security staff	1	1	1	1	4
16	VSL (VA)	3	3	3	3	12
17	Elders	4	4	4	4	16
18	HIV/AIDS/Historically marginalized	2	2	2	2	8
19	Hygiene clubs	5	5	5	5	20
20	Opinion leaders	3	3	3	3	12
21	Health centers	1	1	1	1	4
	<b>TOTAL</b>	<b>73</b>	<b>65</b>	<b>63</b>	<b>63</b>	<b>264</b>

### ***ANNEX 3: Daily log report on CVCA process in Rwimbogo sector***

***Day 1: 30<sup>th</sup> July 2012***

#### **General meeting for introducing the CVCA to the local community**

- Staff convened at the Rwikiniro cow market and was met by citizens of Munini and Rwikiniro cells. The executive secretary of Rwikiniro cell met the RIWSP team and opened the meeting. He explained the purpose of the meeting and the purpose of the work overall.
- The executive secretary invited the facilitators to describe the kind of people they were specifically looking to engage in the CVCA process. The community then selected from among members attending the meeting, the ones to participate in the CVCA
- The CVCA team leader introduced the CVCA and its objectives to participants. The objectives of the assessment were said to be as following:
  1. Estimate how climate change is affecting the community
  2. Assessing the community capacity to adapt to the impacts of climate change
  3. Develop community based counter measures to adapt to changing climate

The CVCA team leader also expressed the necessity of selecting a follow up committee as well as key informants. For the selection of those committees, members of each cell (i.e. Rwikiniro and Munini) grouped themselves, and proceed to the selection of the committee members under the leadership of the executive secretary of the respective cells. The follow up committee was composed of 6 members (3 from each cell) while 10 members (4 from Munini and 6 from Rwikiniro) were selected as key project informants. The terms of reference and purpose of the follow-up committee is—but not limited—to providing the necessary leadership to mobilize communities, monitor donors, and provide any necessary assistance to maintain their sustainable initiatives for the well being of its community members.

***Day 2: 31<sup>st</sup> July 2012***

#### **Assets and Hazard mapping**

Participants were split into four small groups (based on cell). They were also separated by gender to highlight gender preferences for certain resources

- Group 1 – Rwikiniro mixed participants (3W, 13M)
- Group 2 – Rwikiniro Women's group (7W)
- Group 3 –Munini Women's group (4W)
- Group 4 –Munini men's group (11M)

The results from the assets and hazard mapping are given below:



### ***Rwikiniro Mixed Group (Group 1)***

**Livelihood Assets:** Forest, electricity pole but no power yet, roads, water point (well), local authority office/ 2 village offices, school, mosque, church, health centre, trade centre, telecommunication antenna, dairy farm, rice field (marsh land), bees, cow market, valley dam, cash crops - maize field, banana field, quarry, livestock farms, bee keeping

**Hazards:** termites, wind, wild animals, drought

### ***Rwikiniro Women's Group (Group 2)***

**Livelihood Assets:** trade centre, water point (but dysfunctional), church, mosque, banana field, forest, health centre, marsh lands, dairy farms, cow market, local authority office, schools, farm land, valley dam, water tank

**Hazards:** heavy rain, drought

*Further small group and key informant discussions took place about assets and hazards for triangular calculation purposes (Rwikiniro cell).*

**Hazards:** drought caused by heavy sun, heavy wind, livestock disease, wild animal, banana tree disease, rice crop disease, heavy rain,

**Assets:** agriculture land (maize, banana, beans, cassava, rice), livestock (cows, goats), modern crop market, livestock farm, two valley dams, forest, water pipes, water point, trade centre, primary and nursery school, health centre, pharmacy for livestock medicine,

### ***Munini Women's Group (Group 3)***

**Assets:** road, farms, schools, bean fields, maize field, cell office, trade centre, military camp, marshlands, water point, valley dam, flowers, banana field, forest, kitchen garden, rice field,

**Hazards:** Hippopotamus and buffalos at water points that limit water access, drought

### ***Munini Men's Group (Group 4)***

**Assets:** crop land, schools, roads, valley dam, farms, trade centre, banana field, water-Surface water; dams, wells, and valley streams and ground water; boreholes, maize field, church, planted forest, electrical poles, swamp/ marsh lands, cell office, bridges, quarry (Marembo village)

**Hazards:** wild animals ( buffalos, hippos, antelopes), termites, drought, heavy rain, floods, strong winds, Crop diseases ( banana wilt, cassava mosaic, rice wilt), Animal diseases and pests like Tsetse flies that cause sleeping sickness (on humans), foot rot, foot and mouth diseases (on cattle)

*Additional small groups and key informant discussions about assets and hazards were done (Munini cell).*

**Hazards:** heavy rain (leading to erosion), drought, wild animal from national park, heavy wind, banana tree disease, rice disease, cassava disease, termite destroying forest, termite destroying houses, tsetse flies, poor quality water causing stomach problems,

**Assets:** agriculture land (maize, beans, rice, banana), live stock, farm land, housing land, roads, schools, water (pumps for drinking water, valley dam for livestock, irrigation dam for rice), marsh land, forest, telecommunication antenna, quarry, trade centre, electrical pole

## ***Day 3: 1<sup>st</sup> August 2012***

### **Historical timeline and seasonal calendar**

*The historical timeline and seasonal calendar produced by participants are shown in the tables below:*

**Table 5: Historical timeline for Rwikiniro cell**

YEAR	EVENT
1997- 2000	<ul style="list-style-type: none"> <li>- Immigration and initial settlement in the new area (1997)</li> <li>- Rise of the Tsetse flies—they caused Nagana disease to animals and sleeping sickness to humans</li> <li>- Epidemic diseases (e.g. Malaria)</li> <li>- Drought</li> </ul>
2001	<ul style="list-style-type: none"> <li>- Good year with sufficient rains and less hazards</li> </ul>
2002 – 2006	<ul style="list-style-type: none"> <li>- High rates of immigrants following the good conditions in the previous year.</li> <li>- Severe famine (<i>tronc commun</i>)</li> </ul>
2007	<ul style="list-style-type: none"> <li>- Severe drought that caused famine (Kaminuza)</li> <li>- Epidemic diseases (e.g. Malaria and Meningitis)</li> </ul>
2008	<ul style="list-style-type: none"> <li>- Construction of villages for Rwandan refugees who came from Tanzania in 2003</li> <li>- Construction of school, Health centre, and road from Rwagitima through Rwikiniro to Kabeza/Munini</li> </ul>
2009	<ul style="list-style-type: none"> <li>- Good water sources – 5 bore holes, 4 community wells, and 3 animal watering dams</li> </ul>
2010	<ul style="list-style-type: none"> <li>- Presidential elections</li> <li>- Construction of a dairy plant</li> <li>- Construction of water pipeline from Rwagitima to Rwikiniro Village</li> </ul>
2011 – 2012	<ul style="list-style-type: none"> <li>- The ending of the grass built houses for the poor, Government or/and NGOs are working on new home construction projects that are made of mud/bricks with tin roof sheets</li> <li>- Land consolidation promoted</li> </ul>

**Table 6: Historical timeline for Munini cell**

YEAR	EVENT
1997	<ul style="list-style-type: none"> <li>- Immigration and settlement in the cell</li> <li>- Seeking livelihood via trade with outside cells</li> <li>- Animal epidemic caused by tsetse flies from the National Park</li> <li>- Wild animal attack from the nearby National Park</li> </ul>
1998	<ul style="list-style-type: none"> <li>- Construction of primary schools by the community</li> <li>- Construction of dam by the community</li> <li>- Drought that resulted in the death of animals and people that famine and water shortage</li> <li>- Community constructed road for the area</li> </ul>
1999	<ul style="list-style-type: none"> <li>- Villages was designed (because it was a park before)</li> <li>- A lot of rain and crops were abundant (e.g. sweet potatoes)</li> </ul>
2000	<ul style="list-style-type: none"> <li>- Severe drought that caused emigration,</li> <li>- Death of animals and people due to famine</li> <li>- Electricity lines were put in place, but power came later</li> <li>- Different partner organizations joined the cell</li> <li>- Planted trees on 35 hectares of land by 2003</li> </ul>
2001 – 2002	<ul style="list-style-type: none"> <li>- Favorable period of enough rains and food security.</li> <li>- Less disasters</li> </ul>
2003	<ul style="list-style-type: none"> <li>- Severe famine (</li> <li>- Construction of cell office by PDRICU</li> </ul>
2004 -2005	<ul style="list-style-type: none"> <li>- High rate of immigration caused by good conditions</li> </ul>

YEAR	EVENT
	<ul style="list-style-type: none"> <li>- Began government structural adjustment plans</li> <li>- Local primary and secondary schools built</li> <li>- Construction of dams and boreholes</li> <li>- Sufficient rain and productivity</li> </ul>
2006-2007	- Severe famine
2008- 2010	<ul style="list-style-type: none"> <li>- High immigration following good condition of previous year</li> <li>- Good productive year</li> <li>- People resettled into <i>Imidugudu</i> to be in closer proximity of each other to better use public resources (such as schools, health centers, etc.)</li> <li>- Conducted tree planting on 273 ha of land</li> <li>- Built 9 year basic education schools</li> </ul>
2011 – 2012	<ul style="list-style-type: none"> <li>- Floods</li> <li>- Began the construction of water pumps (not yet finished)</li> <li>- Road construction</li> <li>- Built 12 year basic education schools</li> <li>- The ending of the grass built houses for the poor, government or NGO is working on new home construction projects that are made of mud with tin roof sheets</li> </ul>

**Table 7: Seasonal calendar for Rwikiniro cell (more x=higher intensity)**

Months vs. Events	J	F	M	A	M	J	J	A	S	O	N	D
Cultivate		X						X				
Plant seeds/seeding			X						X	X		
Pre-harvesting				X							X	
Harvest		Xx x				X	X					
Short dry season	X	X				X	X	Xx x				
Rain			X	Xx xxx	X				X	X	XX xxx x	XX Xx xxx
Kids holiday				X			X	X			X	X
Flood				Xx x	x							
Human disease	x					X	X					
Livestock disease								X				
Plant seeds of rice	x						x					
Famine				Xx x	X					x	xxx x	
Food secure		X				X	X					
Planting trees										X	X	
Wind								X	x			
Migration							x	X				
Construction period		X				X	X	X				
High birth delivery rate	X	X		X		X						
Time of conflict (people get money, drink, fight)		X					X	X				

Months vs. Events	J	F	M	A	M	J	J	A	S	O	N	D
Water scarcity							X	X				
Famine for livestock							X	X	X			
Firewood scarcity			X	X							X	X
Social security contribution time						X	X					

**Table 8: Seasonal calendar for Munini cell**

Months vs. Events	J	F	M	A	M	J	J	A	S	O	N	D
Short rainy season									x	x	XX X	X
Short Dry season	X	X										
Long rainy season			XX	XX X	x							
Long dry season						x	XX X	XX X				
Planting seeds			x						x	x		
Cultivating		x						X	x			
Pre-harvesting practices				x							x	
Harvesting	x	x				x	x					
Cultivating vegetables (no fixed period, e.g. kitchen garden)	X	X	X	X	X	X	X	X	X	X	X	x
Famine period				x						X	X	
Wind time							x	X				
Food secure		x					x	X				
School holiday				x			x					
Wedding periods							x	X				
Human epidemics				x								x
Milking period (cows)	x	X	X	X								x
Famine for livestock							x	X				

**Day 4: 2<sup>nd</sup> August 2012**

### Vulnerability Matrix

By using scoring chart of 0 to 3, participants ranked hazards that have the most significant impacts on their livelihood Assets (0 meaning no impact and score 3 being the highest impact).

**Table 9: Vulnerability matrix for Rwikinero (Group 1)**

Asset vs. Hazard	Agriculture Land	Cows Farming	Drinking water	Health centre	School
Drought	3	3	3	1	2
Wild Animal attack	2	1	1	1	1
Cattle and Livestock disease	0	3	0	1	2
Banana tree	3	0	0	1	2

disease					
Rice disease	3	1	0	1	2

Below is the list of Options/ Adaptation Measures identified by Rwikiniro group (please note that all the adaptation measures were based on the “3s” of the Vulnerability matrix, i.e. the hazards participants marked as the most severe for a given asset).

<i>Hazards</i>	<i>Assets</i>	<i>Adaptation measures</i>		
		<i>Existing measures</i>	<i>What they need</i>	<i>Challenges</i>
Drought	Agricultural land	Watering crops, Rainwater harvesting Buy fast growing seeds Stocking the crops to use later Using fertilizer Planting fast growing crops	Get machines for watering the crops Study tour (learn from other groups who faced similar challenges)	Low financial status Lack of training
	Cow farming	Decreasing the number of livestock Hay /silage making and storage Planting more pastures	Have enough dams	Machines that dig the dam are expensive Lack of training
	Drinking water	Find water in neighboring areas Digging for water using their hands Construction of community water wells and dams Water storage	To put water tanks in each house Put water supply system everywhere piped water.	To have enough technicians and tools
Livestock disease	Cow farming	Vaccination Healing sick cows Not allowing cows to roam	To have livestock hospital close/ veterinarian	Not having veterinarian close by Poverty
Banana tree disease	Agriculture	To remove the affected plants To spend a year without planting banana tree on the same field Looking for available machines	Bring types of banana trees that are resistant to diseases Having medicine close by	Challenge in not having the medicine close by
Rice disease	Rice agriculture	Spreading medicine To cultivate, plant seed at the same time Make rice field more hygienic Planting at the same time	Plant seeds that can resist disease To have medicine close by	Marshlands Little water

**Table 10: vulnerability matrix for Rwikiniro (Group 2)**

Asset vs. Hazard	Agriculture Land	Cows Farming	Drinking water	Health centre	School
Drought	3	2	3	2	1
Wild Animal attack	2	1	0	1	1
Cattle and Livestock disease	0	3	0	0	0
Banana tree disease	3	1	0	0	2
Rice disease	0	0	0	1	1

**Table 11: Vulnerability matrix for Munini (Group 3)**

Assets vs. Hazard	Maize culture	Cows Farming	Schools	Planted forest	Drinking water
Drought/ too much sun	3	3	0	1	0
Wild Animal attack	3	1	2	0	0
Flooding	1	2	1	0	1
Crops diseases	2	0	2	2	0
Livestock diseases	0	3	2	0	0

*List of Options/ Adaptation Measures*

<i>Assets vs. Hazard</i>	<i>Maize culture</i>	<i>Cows Farming</i>	<i>Schools</i>
Drought	Rain water harvesting Crops stocking tanks Diversifying activities/ look for other sources of income	Stock cow fodder Dams Cultivate cow fodder close to marshlands	
Wild Animal attack	Taking them back to the park and constructing a fence		
Flooding	Dig terraces Dig wells to collect rain water		
Crops diseases			-Make savings, work with cooperatives, be part of saving banks such as SACCO -Seek help from government, NGOs

Livestock diseases		Vaccination Healing the sick livestock Protect from cattle coming from other areas Establish a veterinary hospital	
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**Table 12: Vulnerability matrix for Munini (Group 4)**

Assets vs. Hazard	Maize culture	Cows Farming	Schools	Planted forest	Drinking water
Drought/ too much sun	3	3	1	3	2
Wild Animal attack	3	1	2	0	0
Flooding	1	1	1	0	0
Crops diseases	2	0	1	3	0
Livestock diseases	0	3	1	0	0

*List of Options/ Adaptation Measures*

Hazards	Assets	Adaptation options/measures/strategies
Drought/ too much sun	Maize culture Cow farming Planted forest	Cultivate fast growing crops Irrigation Constructing water retaining dams Stock fodder Prepare trees nurseries Use of fertilizer
Wild animals	Maize culture	Construct a fence around the National Park
Crops diseases	Planted forest	Look for insecticide that kills those insects destroying forest trees and crops
Livestock diseases	Cow farming	Vaccination of Cows Look for sufficient medicine Avoid that cows move around (keep them in the same place) Get trained (to acquire enough knowledge on cow farming)
General challenges	-Limited financial capacity -Some members of the community knowledge have little knowledge	

Additional data

**Key institutions for the implementation of adaptation measures**

- RDB: Rwanda Development Board: overlooking the Akagera National Park



- RDF: Rwanda Defense Force: Helping with chasing away Wild animals from human settlement
- RAB: Rwanda Agriculture Board: providing seeds, fertilizers and other agriculture inputs
- MINAGRI/PADBL: helping farmers in cattle vaccination and healing
- MINAGRI/RSSP: Assist locals in the irrigation techniques
- COPRORIZ: Cooperative of rice growers
- Rwimbogo Dairy Cooperative
- TUREBE KURE: Cooperative of maize growers

### **Key national and district programs to support adaptation measures**

- Imihigo (performance contracts) of districts and sectors
- Umuganda (Community development works)

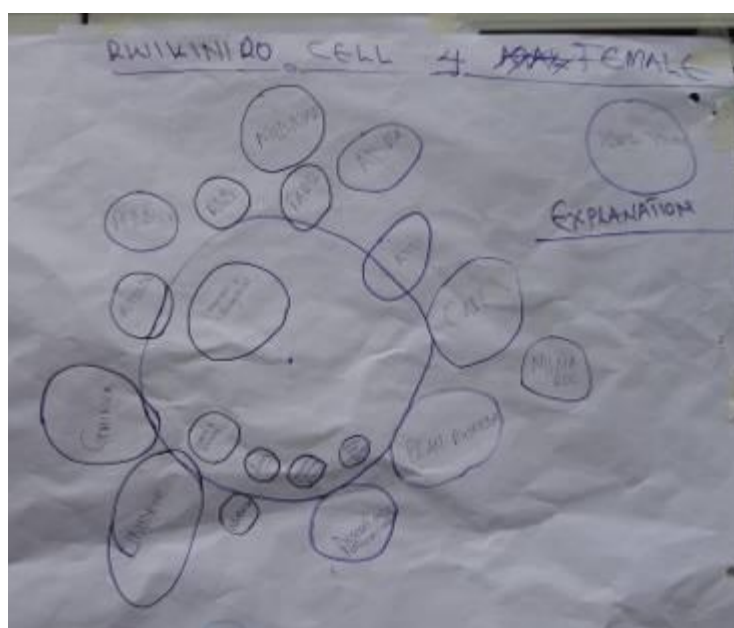
### **Day 5: 3<sup>rd</sup> August 3rd 2012**

### **Venn and Rainbow diagrams**

Groups identified the key institutions and discussed their influence and relevance by giving points based on facts of intervention (1 to 10 points; lowest to highest relevance). This was followed by diagrammatic representation on a Venn diagram by use of circles (smallest to biggest translated as lowest impact (1 point) to greatest impact (9 points))

### ***Venn diagram***

On the last day of the assessment, participants were request to draw a Venn diagram, which shows all the institutions that have influence and impact on their day-to-day life in various aspects. The degree of influence/ impact of each institution on the life of the community are determined by its position on the diagram, as shown in the figure below:



**Figure 4: Example of Venn diagram produced by Rwikiniro cell participants**

The followings are list of institutions as mentioned by the two groups:

### **Munini cell group**

CARITAS, Croix rouge , PLAN Rwanda , PDRCIU , RAB , Association Ndabaga, PACFA, MINALOC , CTM , Girinka , Ubudehe , MIJEPROF, Leadership Authorities , AVIS , VSLA, cooperatives- Motorcycles, farmers.

### **Rwinkiro cell group**

AVSI, CARE, RAB, PLAN International, ADRA, WV, Desert International, RSSP, NDABAGA, UBUDEHE, Girinka, water committee, dairy institutions, farmer association, VSLA, AJPRODO, local authority committee, RDB, FARG, MINALOC, PDRCIU, MIDMAR, mediators...

### **Rainbow diagram**

Based on identified adaptation measures, a feasibility analysis was made based on the impact of adaptation strategy and the measure identified.

#### **Rainbow Diagram for *Rwinkiro Mixed Group***

<i>Feasibility v Impact</i>	<i>Low feasibility</i>	<i>Moderate feasibility</i>	<i>High feasibility</i>
<i>High impact</i>	<ul style="list-style-type: none"> <li>- Seeds (for banana and rice) resistant to diseases</li> <li>-Rain water harvesting</li> <li>-Look for irrigation pumps</li> <li>-Construction of fence to protect from wild animals</li> <li>-Look for medicine that kills tsetse flies</li> <li>-Get animal laboratory</li> <li>-Get medicine for rice diseases</li> <li>-To get goats for milking</li> </ul>	<ul style="list-style-type: none"> <li>-Storage of fodder</li> <li>-Vaccination of animals</li> <li>-Pulling banana roots out of the ground, and waiting 2 years to replant new ones</li> <li>- To go on a study tour to other areas where they are facing the problem and have solved it</li> </ul>	<ul style="list-style-type: none"> <li>-Planting at once to avoid pest attack on rice</li> <li>-To quarantine and treat cattle</li> <li>-Store the harvest</li> <li>- Use of fertilizers</li> </ul>
<i>Moderate impact</i>		<ul style="list-style-type: none"> <li>-Get medicine for banana diseases</li> </ul>	<ul style="list-style-type: none"> <li>-To plant fast growing crops</li> <li>- chase away animals</li> <li>timely treatment of cattle/livestock</li> </ul>
<i>Low impact</i>			<ul style="list-style-type: none"> <li>- Decrease the number of livestock during drought (by selling)</li> <li>-To plant grass/to</li> </ul>

<i>Feasibility v Impact</i>	<i>Low feasibility</i>	<i>Moderate feasibility</i>	<i>High feasibility</i>
			increase food for the cows

### *Rainbow Diagram for Munini Mixed Group*

<i>Feasibility v Impact</i>	<i>Low feasibility</i>	<i>Moderate feasibility</i>	<i>High feasibility</i>
<i>High impact</i>	<ul style="list-style-type: none"> <li>- get banana species that are resistant to diseases</li> <li>-Rain water harvesting</li> <li>-Look for irrigation pumps</li> <li>-Fencing the park to prevent wild animals attack.</li> <li>-Look for trap nets for tsetse flies</li> <li>-Get animal laboratory</li> <li>-Get medicine for termites</li> </ul>	<ul style="list-style-type: none"> <li>-Storage of fodder and silage for animals</li> <li>-Get medicine for treatable/ preventable banana diseases</li> <li>-Vaccination of animals</li> </ul>	<ul style="list-style-type: none"> <li>-Harvest storage</li> <li>-Use of fertilizer</li> <li>-Not allow sick animals near healthy ones</li> <li>-To save money in a bank</li> </ul>
<i>Moderate impact</i>			<ul style="list-style-type: none"> <li>-Plant fast growing crops</li> <li>-To heal sick animals first</li> <li>- Chasing (small) wild animals away</li> </ul>
<i>Low impact</i>			<ul style="list-style-type: none"> <li>-To increase the grass or food for cattle/livestock</li> </ul>

### **Follow up committee members**

#### **Rwikiniro:**

- Karegire John Bosco (Cell Executive Secretary)
- Nzabarantumye Patrick (CNJ)
- Mutesi Karamaga Peace (Cell IDP)

#### **Munini:**

- Rwamucyo Richard (Cell Executive Secretary)
- Mutabazi Joseph (CNJ)
- Uwamahoro Annet (CNF)

### **Participants in CVCA group members: RWIKINIRO CELL**

<b>S/N</b>	<b>Name</b>	<b>Occupation</b>	<b>Phone number</b>
1.	Hakizimana Alexandre	Bee keeper	0784964591
2.	Ntagozera Celestin	Opinion leader	0783504106
3.	Muhirwa Emmanuel	Agricultural cooperative	0785577810
4.	Gakuba Pierre	Livestock cooperative	0783529823

S/N	Name	Occupation	Phone number
5.	Nturanyenabo Jean Nepo	FBO	0788967943
6.	Dusabe Annet	Environmental committee	0788664467
7.	Rugwizangoga Elysee	Village committee	0782187970
8.	Uwimana Pascasie	Village committee	0783350469
9.	Mukagatare Daphrose	Water point	0784124870
10.	Nteziryayo Jean Claude	Education	0788483661
11.	Mukadominiko Drocella	Community health	0782902458
12.	Rudasingwa Charles	Reserve force	0788606856
13.	Mukabalisa Domina	CNF	0788653600
14.	Uwimana Nadia	VSL	0785336797
15.	Nzabarantumye Patrick	CNSR	0784965230
16.	Uwamahoro Peace	VSL	0782479323
17.	Nambajimana Jean Damascene	Agricultural cooperative	0782051666
18.	Ndenzayabo Eric	Water technician	0782902453
19.	Mudaheranwa James	Opinion leader	0788755633
20.	Mutesi Karamaga Peace	IDP	0783222389
21.	Uwizeye Catherine	CNF	0782902455
22.	Karegire John Bosco	Executive Secretary	0787002128
23.	Nkusi Donat	Opinion leader	0783331459
24.	Dusabe Valerie	Conciliator	0786128168
25.	Lumumba Andrew	Opinion leader	0782188660
26.	Munyazikwiye Theogene	Repres of PL VIH-AIDS	0783760622
27.	Bagiriwabo Ange	VSL	0785587020
28.	Habyarimana Gilbert	Sector Agronomist	0784606855
29.	Mbonigaba Theoneste	REMA Intern/ Gatsibo distr.	0788603106

### **Participants in CVCA group members: MUNINI CELL**

<b>S/N</b>	<b>Name</b>	<b>Occupation</b>	<b>Phone number</b>
1.	Bwankarikari Geoffrey	Village committee	0788632700
2.	Ndatira Fabien	Village committee	0782902420
3.	Ngarambe Geoffrey	Elder	0784386479
4.	Kabahizi Alphonse	Environmental committee	0784448750
5.	Nyirarukundo Betty	Water user representative	0783045928
6.	Ndagijimana Faustine	Water user representative	0782661845
7.	Ahimana Amin	CHW	0786345473
8.	Muzirankoni Rose	CHW	0782902424
9.	Mutabazi Joseph	National Youth Committee	0788710467
10.	Uwamahoro Annet	National Women Council	0785587020
11.	Musemakweri Joseph	Opinion leader	0782902435
12.	Kabandana Emmanuel	HIV/AIDS	0785624126
13.	Bizimutima Jean Bosco	Bee keeper cooperative	0783420848
14.	Nzamuhabwa Fabrice	Model farmer	0783747834
15.	Manigaba Papias	CHC	0783611061
16.	Makidade Jeanot	FBO	0782902417
17.	Rwamucyo Richard	Executive Secretary	0788607418
18.	Kamana Floduard	FBO	0782902429

### ***ANNEX 4: Daily log report on CVCA process in Mwili sector***

#### ***Day 1: 30<sup>th</sup> July 2012***

#### **General community meeting at Gasarabwayi/Nyamugali Cell**

Before going on field for this general meeting, the team who were going to facilitate the assessment affected role for each facilitator: Jean Marie Vianney and John Nshaija were tasked to invite identified participants in the general meeting for each community/cell. Around 65 participants, representatives of different structures within the community/cell were invited Leocadie was tasked to facilitate the meeting, Emile the team leader and Mugabo the note taker.

This general meeting took place at Gasarabwayi primary school in Nyamugali cell for both Nyamugali and Kageyo Cells and was officially opened by the Nyamugali cell executive secretary.

The Executive Secretary of the Cell welcomed participant and the team leader introduced the purpose of the meeting. Then the facilitator started the session. During the process, each cell elected its follow up committee composed by the first five participants listed in the table below. A sample of community representatives for the CVCA assessment was selected. 18 representatives were selected in every cell. The meeting continued with the introduction of the schedule for the next four days (Tuesday, Wednesday, Thursday, and Friday). However during the discussion, it was revealed that it will not be possible to meet on Friday since the

population of the two cells has been instructed to stay in their home due to an operation of chasing back wild animal in the National park planned on that day. The program was then rearranged for three days instead of four. Nyamugali cell elected 19 participants for the assessment, among which 6 women and 13 men while Kageyo cell elected 18 participants among which 6 women and 12 men. These are presented in the tables below.

**Table 13: List of CVCA participants in Nyamugali cell**

S/N	Name	Phone	Occupation
1	Rugumaho Faustin	0783368032	Model farmers representative
2	Mukabatsinda Viacine	0783356675	Community health worker and President of CNF (Women Council) in Nyamugali Cell
3	Nyandwi Francois Xavier	0788876832	Youth committee member and Teacher representative at Gasarabwayi Primary School
4	Munyarukato Faustin	0785142699	President of Water Committees in Nyamugali Cell
5	Uwimbabazi Lidivine	0783393098	Community Health Worker and in Charge of Health in the Women Council
6	Gahaya Alphonse	0783212153	President of the Cell Advisory Committee, and President of the farmers Cooperative (Duhuzamaboko) in Mwiri Sector
7	Musirikare Jean Bosco	0784452745	Bee-keepers representative
8	Nyiramugwere Grace	0785469535	Farmers cooperatives
9	Sebuganyali Edward	0785631381	Animal breeders cooperatives
10	Niyitegeka Emmanuel	0786053936	Representative of Faith Based Organizations in Nyamugali Cell
11	Mukagakwerere Eugenie	0783404040	President of Water committees in Nyamugali Cell
12	Sebakunzi Eliezar	0785344477	President of the Environmental committee in the Cell
13	Rutayisire Frodouard	0784817978	Water technician in Nyamugali Cell
14	Bukwengeri Thaddeus	-	Model farmer and elder
15	Iyakaremye Bonaventure	0788252236	Youth representative
16	Murasandonyi Frodouard	0785463457	Reserve force, and in Charge of Security in Rwazana Village and Local defense Representative
17	Ingabire Egidia	0786565427	VSL agent
18	Basideri Immaculate	0788560527	Vulnerable people representative
19	Habyarimana Venuste	0788761706	Cell Executive Secretary

**Table 14: List of CVCA participants in Kageyo cell**

	Name	Phone	Function
1	Semasaka Jean Baptiste President	0785136093	
2	Mukashema Olive V-President	0782308345	Village agent of VSL group
3	Niyomugabo Jackson Secretary	0783034443	
4	Mukabaranga Clodette Advisor	0783334649	
5	Ndahayo Emmanuel Advisor	0788400754	
6	Nyirahabineza Prisca	0783355685	Cell committee
7	Uwingabire Venuste	0783356177	Beekeepers representative
8	Nteziryayo Pierre	0782858383	Farmers cooperatives
9	Katihabwa Jackson	-	Animal growers cooperatives
10	Nsabimana Emmanuel	-	Cell Executive Secretary
11	Ndushabandi Denys	0786304413	Water committee representative
12	Ndamira Joseph Vendeur	0786132931	Environment committee representative
13	Rulinda Felicien	0782923160	Water technician
14	Nyiransabimana Amida	-	Health advisor
15	Mukanoheli Marie Rose	0782923156	Women association (CNF) representative
16	Nikuze Esther	0782493687	Model farmer
17	Musaniwabo Jane	0785202929	Youth association (CNJ) representative
18	Sewada David	0783175901	Reserve force and elder

***Day 2: 31<sup>st</sup> July 2012*****Asset, Hazard mapping and Seasonal calendar**

Communities were split into 4 groups: two groups per cell. All the groups were gender mixed. Two activities were on the agenda of the day: (1) asset and hazard mapping and (2) seasonal calendar.

**List of assets and hazards identified in Nyamugali Cell**

**Livelihood Assets:** Land, marshlands, roads, churches, schools, health center, forests, electricity, water, market centers, water sources, bridges, farms, minerals, tree nurseries, wells, offices of the cell, offices of the cooperative.

**Hazards:** Drought, heavy rains, diarrhea, high incidence of malaria, famine, tsetse fly, HIV&AIDS, poultry disease, wild animals, migration, striga, floods, termites, erosion, mosquitoes.

#### **List of assets and hazards identified in Kageyo Cell**

**Assets:** Land, marshlands, roads, churches, schools, health center, forests, boreholes, valley dams, trade centers, bridges, farms, minerals, tree nurseries, wells, offices of the cell, office of the cooperative, Akagera national park, women handcraft house, livestock, beekeeping, dairy, lake (Ithema), village settlement.

**Hazards:** Drought, heavy rains, diarrhea, famine, tsetse fly, poultry disease, wild animals, migration, plants disease (kagungu), floods, striga, termite, erosion, mosquitoes, meningitis, malaria, heavy rain, bush fires.

#### **Seasonal calendar: Nyamugali cell**

Month Vs Activities/Events	1	2	3	4	5	6	7	8	9	10	11	12
Preparing land	x	x										
Preparing seeds		x										
Planting seeds			x									
Weeding			x									
Harvest		x				x						
Food storing			x				x					
Holidays	x			x			x					x
Period of weddings							x	x				
Selling of produce			x	x								
Construction						x	x	x				
Dry season						x	x	x	x			

#### **Seasonal calendar: Kageyo cell**

Month Vs Activities/Events	1	2	3	4	5	6	7	8	9	10	11	12
Land preparation	x	x					x	x	x			
Selecting seeds			x						x			
Planting			x							x	x	
Weeding				x	x						x	x
Storage			x				x	x				
Drought	x	x				x	x	x				
Rainfall			x	x	x					x	x	x
Holidays	x	x		x			x					x
Termites					x	x						

#### ***Day 3: 1<sup>st</sup> August 2012***

#### **Historical timeline, Vulnerability matrix and list of adaptive measures**

Three activities were on the agenda of the day. The first activity was the development of historical timeline of hazards. The second activity was to choose the most important assets and hazards from the lists produced the day before and develop a vulnerability matrix. Lastly, adaptation measures were suggested against key hazard identified in the vulnerability matrix.



The tables below show the historical timelines, vulnerability matrix as well as the lists of adaptation measures of both cells, as produced by the local communities.

**Table 15: Nyamugali historical timeline**

<b>YEAR</b>	<b>EVENTS</b>
1973	Famine
1973 – 1976	<ul style="list-style-type: none"> <li>- Malaria</li> <li>- Heavy rains</li> </ul>
1978	<ul style="list-style-type: none"> <li>- Rwakagungu famine</li> <li>- Plants disease (kagungu)</li> </ul>
1982	<ul style="list-style-type: none"> <li>- Rwambaraje famine</li> <li>- Hail stones</li> </ul>
1987 – 1988	<ul style="list-style-type: none"> <li>- Famine (Ntuntire akayungiro)</li> </ul>
1991 – 94	<ul style="list-style-type: none"> <li>- Famine (Rusambura amabati)</li> <li>- Drought</li> <li>- War (genocide)</li> </ul>
1995	<ul style="list-style-type: none"> <li>- Poultry disease</li> </ul>
1996 – 97	<ul style="list-style-type: none"> <li>- Famine (Ntuntire agafuni)</li> <li>- Drought</li> <li>- HIV &amp; AIDS</li> </ul>
1998	<ul style="list-style-type: none"> <li>- Caterpillar invasion</li> <li>- Diarrhea</li> </ul>
1999 – 2000	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Famine</li> </ul>
2002	<ul style="list-style-type: none"> <li>- Meningitis</li> </ul>
2004 – 2008	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Famine (Kinga umwuzukuru araje)</li> </ul>
2009	<ul style="list-style-type: none"> <li>- Striga</li> </ul>
2010 – 2012	<ul style="list-style-type: none"> <li>- Termite</li> <li>- Wild animals</li> <li>- Diarrhea</li> </ul>

**Table 16: Kageyo historical timeline**

<b>YEAR</b>	<b>EVENTS</b>
1998	<ul style="list-style-type: none"> <li>- Wild animals</li> <li>- Termites</li> </ul>
2000 – 2001	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Death of cattle</li> <li>- Migration</li> </ul>
2002	<ul style="list-style-type: none"> <li>- Famine</li> </ul>
2003 – 2005	<ul style="list-style-type: none"> <li>- Drought</li> </ul>
2006	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Termite</li> </ul>
2007	<ul style="list-style-type: none"> <li>- Drought</li> <li>- Tsetse fly</li> </ul>
2008	<ul style="list-style-type: none"> <li>- Heavy rains</li> <li>- Human deaths</li> </ul>
2009	<ul style="list-style-type: none"> <li>- Destruction of crops by wild animals</li> <li>- Termite</li> </ul>

2010	<ul style="list-style-type: none"> <li>- Floods</li> <li>- Storm</li> <li>- Termite</li> </ul>
2011	<ul style="list-style-type: none"> <li>- Wild animals</li> </ul>
2012	<ul style="list-style-type: none"> <li>- Striga</li> <li>- Floods</li> <li>- Termite</li> </ul>

**Table 17: Vulnerability matrix of Nyamugali cell<sup>14</sup>**

<b>Assets vs. Hazards</b>	<b>Roads</b>	<b>Market centers</b>	<b>Water sources</b>	<b>Land</b>	<b>Schools</b>	<b>Forests</b>
<b>Drought</b>	1	2	3	3	2	3
<b>Famine</b>	0	2	0	0	2	2
<b>Wild animals</b>	0	1	0	0	1	0
<b>Erosion</b>	3	2	3	3	2	3
<b>Floods</b>	3	2	3	3	2	2
<b>Termite</b>	2	2	1	1	2	3
<b>Striga</b>	1	3	1	3	1	0
<b>Malaria</b>	0	1	1	0	2	1

**Table 18: Vulnerability matrix of Kageyo cell<sup>15</sup>**

<b>Asset vs. Hazards</b>	<b>Livestock</b>	<b>Water sources and boreholes</b>	<b>Schools</b>	<b>Roads</b>	<b>Land</b>	<b>Crops</b>
<b>Famine</b>	3	0	2	0	0	0
<b>Drought</b>	3	3	2	0	3	3
<b>Wild animals</b>	0	0	1	0	0	3
<b>Striga</b>	2	0	1	0	3	3
<b>Erosion</b>	1	3	2	3	3	3
<b>Termite</b>	0	1	0	0	1	1

**Table 19: List of adaption measures for Nyamugali cell**

<b>Hazard</b>	<b>Assets</b>	<b>Adaption Measures</b>
Drought	Crops/land Water sources	-Small scale irrigation -Tree planting on hills - Mulching - Modernized farming - Rain water harvest
Erosion	Water sources and boreholes Roads Land Crops	-Digging dams -Tree planting -Forest protection and management -Progressive terracing
Tsetse fly and pest		-Use of pesticides
Striga	Crops	-Use of fertilizers -Dig out and burn -Crop rotation
Wild animals	Human settlement Livestock Crops	Fencing

<sup>14&12</sup> The ranking was between 0 and 3; with 0 meaning that the hazard does not affect the corresponding asset and 3 that the hazard highly affects the corresponding asset.

**Table 20: list of adaptation measures for Kageyo cell**

<b>Hazard</b>	<b>Assets</b>	<b>Adaption Measures</b>
Famine	Crops  Cattle famine	<ul style="list-style-type: none"> <li>- Food storage (at HH level and at community level)</li> <li>- Planting resisting crops (maize, beans, sorghum, soya beans)</li> <li>- Tree planting for cattle food(fodder)</li> <li>- Avoid bush fires</li> <li>- Fencing (using vegetation limiting cattle roaming)</li> </ul>
Drought		<ul style="list-style-type: none"> <li>- Rain water harvesting</li> <li>- Tree planting</li> <li>- Small scare irrigation</li> <li>- Drought resisting crops (cassava)</li> <li>- Marsh land exploitation</li> </ul>
Wild animals	Crops	<ul style="list-style-type: none"> <li>- Fencing (being done)</li> <li>- Seek government support</li> </ul>
Striga	Crops	<ul style="list-style-type: none"> <li>- Requesting government support (Herbicides)</li> <li>- Planting resisting crops (beans, soya beans, Irish potatoes, sweet potatoes and cassava)</li> </ul>
Erosion	Land, crops, schools, roads etc	<ul style="list-style-type: none"> <li>- Terracing</li> <li>- Trees planting</li> </ul>
Cattle carcass	Livestock and farms	<ul style="list-style-type: none"> <li>- Cattle immunization</li> <li>- Dipping</li> </ul>
Human diarrhea		<ul style="list-style-type: none"> <li>- Promote hygiene</li> <li>- Drinking safe and clean water</li> <li>- Use of improved latrines</li> <li>-Timely medical consultations</li> </ul>
Termites		<ul style="list-style-type: none"> <li>-Government to avail pesticides</li> <li>-Destroy termite hills</li> </ul>
Tsetse fly		<ul style="list-style-type: none"> <li>- Use of pesticides wash</li> <li>- Government to avail pesticides</li> </ul>

***Day 4: 2<sup>nd</sup> August 2012*****Rainbow and Venn diagrams**

Two activities were on the agenda of the day. The working groups had to draw a rainbow diagram for the measures they proposed the previous day and then draw a Venn diagram.

The results obtained from both diagrams in the two cells are shown in the tables below.

**Table 21: Rainbow diagram results, Nyamugali cell**

<b>Feasibility v Impact</b>	<b>Low feasibility</b>	<b>Moderate feasibility</b>	<b>High feasibility</b>
<i>High impact</i>	Marshland exploitation Rain water harvesting Terracing Small scare irrigation Dig out and burn striga Tree planting Maintenance of water sources (wells) Human immunization Improving technical activities Trading Use of pesticide	Food storing Use of chemical fertilizer Fighting erosion Mulching Modernized farming	Crops rotation Use of manure fertilizer Forest management (forest protection against illegal tree cutting and fire wood collecting) Use of modernized seeds Use of mosquitoes nets
<i>Moderate impact</i>	-	Tree planting on hills	-
<i>Low impact</i>	-	-	-

**Table 22: Rainbow diagram results, Kageyo cell**

<b>Feasibility v Impact</b>	<b>Low feasibility</b>	<b>Moderate feasibility</b>	<b>High feasibility</b>
<i>High impact</i>	Marshland exploitation Government to avail pesticides Prevent wild animals from raiding crops where possible and seek government support Destroy termite hills Get herbicides from government Rain water harvesting (cost of tanks) Small scare irrigation Fencing the boundaries of Akagera park Marshland exploitation Use of good sanitation and improved latrines Digging valley dams	Avoid bush fires Food storing	Planting resisting crops (e.g. cassava) Terracing Tree planting for cattle food Farm fencing using vegetation Dipping Having medication on time
<i>Moderate</i>	-	Use of pesticides,	-

<i>impact</i>		wash, vaccination and seek government support	
<i>Low impact</i>	-	-	-

**Table 23: Results of Venn diagram, Nyamugali cell**

<b>High influence</b>	<b>Medium influence</b>	<b>Low influence</b>
Schools, Mutuelle de santé, Red Cross, VUP, Health centers, Cell authorities, RDB, RSSP, Farmers cooperatives, bee keepers cooperatives, REMA	MINALOC, Sector authorities, District authorities, Province authorities, SACCO, ADRA, EWSA, Partners in health, BTC, WFP, RIWSP, Global Fund, SORWATOM, Compassion	Mining, NCA, FARG, RAB, RDF

**Table 24: Results of Venn diagram, Kageyo cell**

<b>High influence</b>	<b>Medium influence</b>	<b>Low influence</b>
Cell authorities, KAPECO, Village authorities, Conciliators, VUP, UMOJA, Farmers cooperative, community health workers, beekeepers cooperative, Inkeragutabara, VSL groups, RDB, National women council, SACCO, Mutuelle de santé.	New Life Ministries, Compassion, Prison fellowship, Caritas, CARE, URUGO RW'AMAHORO, ARBEF, health centers, TWITEGANYIRIZE, RIWSP, FBO.	Mining, RWARRI, FARG, District, Province, RDF, MINAGRI, RSSP, EWSA, Red Cross, ADRA.

## **ANNEX 5: Extract from Rwanda's Second National Communication (SNC)**

### **Submitted by the Republic of Rwanda to the UNFCCC on June 5, 2012-08-13**

The Adaptation Section of the SNC (Chapter 4) includes a sector assessment focusing on Water, Agricultural, Forestry and Health in the context of Rwanda's national economy.

The action plan for the implementation of adaptation measures to climate change in the sector of water resources in Rwanda (Table 58, page 116), which may be of particular interest to RIWSP, includes these 15 objectives:

1. Empower local authorities and other partners in the rational and participatory management of water resources.
2. Strengthen the basic knowledge and develop information systems on water resources.
3. Develop and strengthen programs for integrated management of water resources.
4. Empower local authorities and other partners in the establishment and operationalization of an emergency plan against droughts.
5. Strengthening the information system and early hydro-agro-meteorological warning mechanisms
6. Provide the population of vulnerable regions with new techniques of fighting against drought
7. Ensure better use of water resources
8. Ensure better watershed management
9. Empower local authorities, population and other partners in the integrated management and planning of watershed
10. Ensure the conservation of land and increasing agricultural production in 4 pilot watersheds
11. Reinforce regional and international cooperation
12. Mobilize for the implementation of national action plan for adaptation to climate change in the sector of water resources.
13. Strengthen a basic knowledge and develop information and monitoring systems for vulnerable aquatic ecosystems
14. Ensure monitoring of the phenomenon of the degradation of water resources
15. To orient, plan and monitor the implementation of national action plan for adaptation to climate change in the sector of water resources.

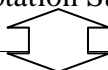
The national action plan for adaptation and implementation in agriculture indicates these objectives and expected results:

1. Develop irrigation techniques - Irrigation on hills is practiced in vulnerable regions.
2. Improve soil conservation techniques - Erosion control is practiced in highlands.
3. Help poor population - A rapid warning system is put in place and food security is improved.
4. Strengthen the hydro-agro-meteorological information system - Regular warnings on climate manifestations.

## ANNEX 6: CVCA in Rwanda's national climate change policy context

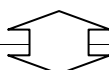
### International climate policy and finance context

UNFCCC – COP Negotiations  
Focus on Adaptation  
Finance for Adaptation including Fast Track and Green Climate Funds  
Several other sources: Adaptation Fund, LDC Fund, WB's CIF/PPCR, AfDB  
NAPA for LDCs >>>> National Adaptation Strategy and guidance (new)



### Government of Rwanda – National and Regional policy

Vision 2020, EDPRS, East African Climate Policy  
Programs and initiatives of various Ministries and Agencies –  
MINIRENA – RNRA, REMA, MINAGRI



### Rwanda Integrated Water Security Program (RIWSP)

Climate Change, Multiple Use Water Services/Water Resources, Hygiene, Health & Sanitation, Livelihoods, Agriculture/Food Security, Sub-grants, Micro-Credit  
Resources for program implementation till 2016



### CVCA methodology – in use internationally

Climate Vulnerability and Capacity Assessment  
Systematic, rigorous, linking science to local knowledge  
“Adaptation is local”



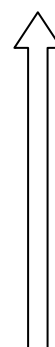
### CVCA Assessment in Gatsibo and Kayanza Districts

in Mwili and Rwimbogo Sectors (4 cells); Community ownership of outputs  
Impact of hazards on community assets assessed; adaptation measures proposed, then assigned priority by community for impact and feasibility; community assesses institutions, agencies and programs for most influential to help them  
CVCA Analysis >>>> Adaptation Plan (community specific)



### Implementation of Community-based Adaptation Measures

Integrate outputs of community-based CVCA adaptation planning into RIWSP  
Integration with District and Sector Annual Plans  
Potential integration with national programs of relevant Ministries





**RIWSP in Akagera and Akanyaru sub-basins**

RIWSP targets additional CVCA assessments in more Sectors and Cells

**Train 300** staff of local government, NGOs & CSOs in CVCA assessment methods

**Reach 4000** community members in target areas, e.g., through public dialogue events

## ANNEX 7: Adaptation plans for the four Cells<sup>16</sup>

### Kageyo cell adaptation measures

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long term Benefits	Target	Indicator	Cost	Responsible institution
1. Plant & harvest crops with long storage durability (Beans, sorghum) in cooperatives and at household level	Food insecurity	New storage facilities at HH level for maize, bush beans, soya, sorghum	F = High I = High		Prepare land, planting sorghum and rotate with beans, store produce	Food available in dry season	Increased food security		# of grain harvest facilities constructed at HH level		
2. Bench terracing & progressive terracing	Erosion	New terraces constructed	F = High I = High		Dig terraces and canals, plant trees	Increased area for food production, reduced hillside erosion	Increased soil management and food security		# of hectares of terraced land created		
3. Increase production of drought resistant crops (cassava)	Foods insecurity	More cassava grown	F = High I = High		Find new drought-resistant varieties of disease-free cassava	More food for dry season	Increased food security		# of hectares of drought resistant cassava grown		
4. Plant more reed for cattle fodder	Animal food insecurity	Increased fodder availability in dry season	F = High I = High		Promote and facilitate the plantation of reed	Stronger cattle herds	Stronger rural economy; food security		# of farmers participating; number of hectares planted		
5. Farm land fencing using vegetation to control cattle	Crop lands destroyed by foraging cattle	Improved crop land management	F = High I = High		Promote, facilitate take-up of vegetation fence construction, distribution of remaining farms.	Reduced crop destruction	Food security, conflict reduction		# of HHs 'planting' these fences		
6. Cattle immunization	Animal herd loss	Cattle disease control	F = High I = High		Solicit government assistance in implementing this measure, cattle	Reduced cattle deaths from disease	Reduced cattle deaths from disease		# of cattle immunized		

<sup>16</sup> Please note that the content of these adaptation plans were filled by communities of respective cells to ensure ownership of the plans by locals.

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long term Benefits	Target	Indicator	Cost	Responsible institution
7. Cattle dipping to control disease	Animal herd loss	Cattle disease control	F = High I = High		immunization Solicit government assistance in implementing this measure	Reduced cattle deaths from disease	Reduced cattle deaths from disease		# of cattle dipped		
8. Promote hygiene to reduce diarrhea	Human health reduction	Improved hygiene	F = High I = High		Cook drinking water, vaccinate against diarrhea, mobilization from community health workers, seek help from health services, hand wash	Reduced lost of productive days	Improved human health		Reduction in # of people reporting diarrhea in clinics (poor indicator)		
9. Increase consumption of clean water			F = High I = High	Community mobilization to fight against diarrhea and other related diseases					Increase in # of people boiling water (poor indicator)		
10. Cultivate crops resistant to striga	Food insecurity	Increased production of tubers (e.g., sweet & Irish potatoes) and legumes	F = High I = High	Striga control technology					# of hectares with tubers and legumes		
11. Increase small scale irrigation using hand operated systems	Food insecurity	Introduce hand held mechanical spray pumps and improve capacity of current bucket system irrigation	F = High I = High						# of hand-held mechanical spray pumps; # of buckets improved		
12. Bush fire control			F = Med I = High		Fencing the park, sensitize community on the risks of burning bush fires, set up penalties						
13. Storage of harvested grain at HH level	Food insecurity	More food available in dry season	F = Med I = High	Cooperative	Select target HHs, choose appropriate storage methods, train HH and monitor	Food available when needed after sale of grain to buyers	Food self sufficiency		Number of HH participating		

### Nyamugali cell adaptation measures

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implement- ation Steps	Immediate Benefits	Long term Benefits	Target	Indicator	Cost	Responsible institution
1. Improve forest management	Deforestation	Reduce illegal cutting in defined or plantation areas	F=High I=High	Government inventory of forest cover and	Set up monitoring system, set penalties, conduct awareness campaign to promote measure, find alternative energy sources, get District & Sector support	Maintain trees for shade and soil stability	Forests maintained, forest loss reduction		# of hectares with low loss of tree		
2. planting trees on HH lands	Loss of natural resources	More trees for shade, firewood, soil stability,	F=High I=High	Nursery trees available at sector level	Confirm seedling supply, set target area to plant, recruit planters set date(s)	Early action at HH level, new trees planted for long term use	Reduced loss of soil moisture, soil stability, shade for some crops		# of trees planted, # of HH participating		
3. Crop rotation where maize and sorghum is grown	Striga infestation	Reduction in striga prevalence; rotation: beans > tubers > bean > tubers > grain	F=High I=High	(any?)	Confirm the rotation is correct , farmer education / training, media strategy (campaign)	Maintain food production,	Increased food yields; striga elimination		# of hectares under correct crop rotation		
4. Increase use of mosquito nets	Malaria increase, poor health of people	More people use nets	F=High I=High	Clinics distribute nets; check on current use; check trends in malaria cases	Promote HH use of nets, monitor HH use of nets (reporting at clinics?)	Less malaria at HH level	Improved health, less sickness fewer days lost		# of nets in regular use (need to have baseline number)		
5. Tree and grass planting on edges of marshlands, canals, riverbanks	Erosion during rainy season floods	Stable riverbanks, reduced erosion reduced silting of canals	F=High I=High	Seedlings available at Sector level	Decide on tree & grass types, get supply of grass seeds & seedlings, plan and execute planting when labor is available	Early action, stable banks of water courses	Sustainable river water system, reduced dredging		# of trees planted, # of hectares planted with grass, trees		
6. Grass and tree planting around ground water recharge areas	Soil, erosion, reduction in water availability	Stable soils, less erosion, better rain absorption into ground	F=Medium I=High		(same as above)	Reduce erosion in water recharge areas	Sustainable ground water availability		# of hectares planted with trees and grass		
7. Increase use of manure	Soil depletion, food shortage	Improved crop production of bush beans and maize	F=Medium I=High		Manure collection, put into soil during soil preparation	Increased harvest of beans and maize	More sustainable food production		# of hectares with increased manure use		
8.Increased use of mulching	Soil erosion, soil moisture	Soil less dried out; more collection of	F=Medium I=High								

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implement- ation Steps	Immediate Benefits	Long term Benefits	Target	Indicator	Cost	Responsible institution
	loss, food shortage	manure									
9. Storage of harvested crops	Hunger, famine	HH food storage facilities and management at HH level	F=Medium I=High	Cooperative, history of failed storage	Select target HHs, choose appropriate storage methods, train HH and monitor	Food available when needed after sale of grain to buyers	Food self sufficiency		Number of HH participating		
10. Improve canals in valley area	Flood	Better maintenance of water systems in marshland	F=Medium I=High		Select specific areas for attention, mobilize labor, ensure community benefits	Improved water flow rates through the system	Flood management more effective across marshlands / valley		# of km of canals improved		
11. Acquire hand held manual pumps for small scale irrigation		New irrigated land means increased food production on dry lands	F=Medium I=High	Marshland water management	Acquire funds and equipment, training of operators, ensure community benefits	More land under cultivation for food crops	More food self sufficiency, food security		# of hand held pumps, # of people trained in maintenance of hand held pumps		
12. Improved practices in farming (access best practices in agriculture appropriate for Nyamugari)	Food shortages, famine in dry season	Use of drought and disease resistant, and fast maturing crop varieties; mulching, irrigation			Determine new varieties to be used, acquire the seeds, determine, distribution methods	More cassava, vegetables, available	More food self sufficiency, food security		# of farmers using new plant varieties		

### Rwinkiro cell adaptation measures

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Beneficiaries
1. Planting at the same time (simultaneously) to avoid pest attack on rice	Rice diseases <sup>17</sup>	More coordination on rice planting	F= High I=High	COPRORIZ & RSSP(Rural Sector Support Project): are providing irrigation canals in the rice fields	Agreement among farmers on measures; Check out if the simultaneous planting will resolve the problem of pest attack; Coordination of all rice farmers;	Increase production of rice; increase of mulching in the banana field from waste from rice; food for cows(also from waste)	Food security, poverty reduction; economic development of the area	950 hectares of rice field to be irrigated to allow simultaneous planting <sup>18</sup>	Number of hectares irrigated	1000-1200 House-holds
2. Quarantine and treat sick cattle	Livestock diseases <sup>19</sup>	More rapid response to evidence of sickness; Increase of supply of medicine	F=High I=High	Livestock blood are being taken and tested in the Nyagatare veterinary (neighboring district)	Get medicine/ vaccine against tsetse flies; In case of an epidemic disease all the sector is put under quarantine and quarantine directives are applied	The epidemic disease is contained	Food security; Poverty reduction; Economic development	100% of livestock are vaccinated	Percentage of livestock vaccinated	The whole Cell

<sup>17</sup> This is a disease that results in the drying of rice before its harvest.

<sup>18</sup> 600 hectares out 950 are already being developed

<sup>19</sup> The most severe one is caused by tsetse flies (locally called Nagana disease), which leads to foolishness of cows. Also a disease called Uburenge (injury of the month and toes)

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Beneficiaries
3. Store the harvest at community level	Drought	New facilities and practices	F=High I=High	Existence store tank in the Cell office (500tons) <sup>20</sup>	Change of minds (sensitization of community on the importance of storing); Discussions, Agreements; To place a storing tank in each village.	Availability of food in reserve for famine seasons; Decrease of famine; Sell at higher price	Food security; Improved livelihood	Tanks of 50 tons for each village	Number of tanks built	The whole cell
4. Use fertilizers <sup>21</sup>	Drought	New agriculture practices	F=High I=High	RAB (Rwanda Agriculture Board) is providing fertilizers at incentive price	The fertilizers should be more available (sold closer to the community); Resource mobilization; Acquisition of fertilizers	Increased crops production	Food security; Poverty reduction	100% of farmers using (presently only 30%) do so.	Percentage of farmers having access and using fertilizers	The whole cell
5. Plant fast growing crops	Drought	New agriculture practices	F=High I=Medium	RAB (Rwanda Agriculture Board) is providing improved seeds at incentive price	Look for fast growing seeds; educating farmers about importance of fast growing crops in climate vulnerable communities	More crops in shorter amount of time	Food security; Poverty reduction		No cases of famine; Tons of crops produced	Farmers in the whole cell

<sup>20</sup> Though there is an existence of a store tank in the cell that was provided by the Government, communities are not using it. They said that they prefer to keep their harvests in their houses because the one in the Cell has rules on that they don't want to follow (like not taking from the stock before drought/famine period; paying someone to manage the stock)

<sup>21</sup> Those who have cows are using cow dung as fertilizers.

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Beneficiaries
6. Timely treatment of cattle/ livestock	Livestock diseases	Early detection of sick animals	F=High I=Medium	Livestock blood are being taken and tested in the Nyagatare veterinary (neighboring district)	Mobilization of farmers; ease access to veterinary services; provision of appropriate drugs	Decrease of livestock lost;	Food security; poverty reduction; economic development of the area	All livestock in the cell	Liters of milk produced; tons of meat sold	Livestock keepers in the whole cell
7. Decrease the number of livestock in farms during drought period (by selling some)	Drought	Due to the decrease of plot size allocated to each farmers, farmers have already started to sell some of their cows	F=High I=Low	There is already a existing regular livestock market	To look for favorable markets; Organize market places; improve the race of cows by artificial insemination	Keep cattle that the owner is able to feed; improved race of cattle	More livestock productivity		Liters of milk produced; tons of meat sold	Livestock keepers in the whole cell

### Munini cell adaptation measures

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Cost	Responsible institution
1. plant rice and harvest simultaneously	pest attack on rice	More coordination on rice planting	F=High I=High	COPRORIZ (a co-op of rice growers) is already doing it	Community consultation, education about rice attack save personal funds to purchase all seeds at once, have all rice seeds and agricultural products to plant at once,	Yield increase during months of pest attack, prevent pests from increasing hunger/malnutrition, Efficient use of fertilizers	More rice to ensure food security Poverty reduction	1.5 tons per 20 acres	# of tons of rice harvested during months that were previously influenced by pests	150,000Rwf /20 acres	
2. To have Harvest storage facilities	Drought (No facilities to store food for period of drought)	Mindset in using new facilities and practices	F=High I=High	Availability of a CACOON at cell level but not used	Community mobilization, Look for a dry place for storage prior to harvesting crops, find source of finding for buying storage facilities, harvest, store	have food for dry months, sell additional crops for money,	Food security, sell additional crops for money (improved financial status of farmers)	200 – 400 kg of crops stored by HH	# tons of crops stored	5,000,000 Rwf	



Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Cost	Responsible institution
3.To use fertilizer	Drought (which causes lower crop yield/failing crops due to less nutritious soil )		F=High I=High	Subsidized distribution of fertilizers on consolidated land	properly Sensitization of farmers to use fertilizers, Purchasing/making fertilizer requirements, initial cost of fertilizer, storage of fertilizer,	Maintain and improve food production and quality & quantity	Food security, more consistent crop yields, better personal finances,	Double the current production	# of tons of crops produced annually	42,000 Rwf/ha	
4.To put sick livestock in quarantine	Loss of livestock due to spread of illness	More rapid response to evidence of sickness; Increase of supply of medicine	F=High I=High	Done in case of epidemic like mouth disease	Identification of sick animals, quarantine and heal sick animals, promote better living conditions for all animals, vaccinate healthy animals	To stop the spreading of the disease, Improved livestock health	Food security, Poverty reduction	All sick animals (target can be set only in case of epidemics)	# of animals dying per year reduced	-	
5. To save money in bank and SACCOs	Drought (pushing farmers to use savings)	To adopt the culture of saving	F=High I=High	VSL classes/ Group 60% of the population of Munini have bank accounts	Bring awareness about importance of personal finance, encourage VSL participation along with bank use, make a partnership with a bank to help first time account owners become more educated about personal finance,	More organized and less money lost, better personal finance	Financial independence and security,	4,000 RwF /month for the poorest	# people using banks and SACCOs services	-	
6. To plant fast growing crops of maize and beans	Drought (leading to hunger/no food because foods need more time to grow especially after stresses such as plant diseases and droughts )		F=High I=Moderate	Distribution of fast growing seeds of maize only for consolidated lands	Educating farmers about importance of fast growing crops in climate vulnerable communities, Find local access to fast growing seeds/crops,	More crops in shorter amount of time	Food security; improved livelihood	Maize and beans that last 3 months instead of 4	# tons of crops produced in shorter terms (3 months)	50,000 Rwf/ha	
7. To chase away small	Wild animals attack –		F=High I=Moderate	-	Using noise makers (e.g. empty Jerry cans, tins) to	Reduced loss of personal	Improved livelihood	Dig a 28 km trench	Length of trench dug	3,000 RwF/m =	

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Cost	Responsible institution
wild animals (e.g. monkeys, wild pigs, etc...)	harming food crops, people, and livestock				push them out of their property, Dig a long trench along the border of the National Park	belongings—crops, etc.			#	84,000,000 RwF	
8. To store fodder and silage for animals	Drought (leading to starving/hungry animals during dry season )		F = M I=H	-	Train farmers to the process of grass storage and silage, To grow enough grasses Look for resources to purchase storage facilities,	Have an immediate emergency storage of food for the animals, healthier cattle	Improved quality and quantity of milk produces, decrease of malnutrition, improved livelihood	13,5 tons /cow during 3months	Health of the animals during the toughest times/shocks	270,000Rwf/cow.	
9. To get medicine for preventing banana disease	Loss of banana crop due to diseases		F = M I=H	-	Consultation with Research centers, Train banana growers, Seek expert advice Avail the products	Increased banana yield	Food security, improved livelihood	100% of infected banana	# of tons produced	-	
10. Get banana species that are resistant to diseases	Loss of banana crop due to diseases		F=L I=H	Such species exist in the neighboring sector of Kiramuruzi	Make study trips Identify banana species that are resistant; Find/secure fund to purchase them; Disseminate them among farmers	Increased banana yield,	Higher crop yield that allows for more farmer income and food security	About 1500 HH banana growers	# of ha of new planted banana	3,000,000 RwF /ha	
11.To harvest rain water to be used in dry season	Drought (scarcity of water for household use and irrigation)		F=L I=H	1 person who did it in the cell	Community sensitization, Resources mobilization; Purchase water storage plastic tanks for community use.	Water security	Decrease of water borne diseases, higher crop yield → more food to eat and crops to sell	16 tanks of 800m <sup>3</sup> (2 tanks per village)	# of m <sup>3</sup> of water stored	19.200,000 RwF	
12. Look for irrigation pumps	Drought (Lower crop yields due to lack of water)		F=L I=H	-	Identify the appropriate irrigation technology; Find water source and establish irrigation pumps to allow for flowing irrigation; secure funds to purchase the pumps	Increased irrigated lands	Economic empowerment through selling off higher crop yields; improved livelihood	600 ha  1 machine to water 3 ha	# hectares of irrigated lands		
13. Look for trap nets for tsetse flies	Illnesses causes by tsetse flies (to both		F=L I=H	-	Resource mobilization, Identify the critical places to put the traps with the support of RDB,	Reduce tsetse fly illnesses	Reduced tsetse flies, problems on human and cattle illnesses	56 traps (2traps/km)	# of traps put in place,  Incidence of	-	

Adaptation Measure	Hazard	Anticipated change	Feasibility/ Impact	Parallel activity	Implementation Steps	Immediate Benefits	Long-term Benefits	Target	Indicator	Cost	Responsible institution
	humans and cattle)				Purchase nets from market and make the traps		related to the tsetse flies		tsetse flies related diseases		
14. To get animal laboratory	Poor health of livestock		F=L I=H	On in Huye District, Southern Province (RAB)	Make advocacy to decision makers, Make a follow up	Prevention from animal illnesses	help animals live longer and healthier lives to be more productive on lands and provide more byproducts	11,700 cows are concerned	Existence of a laboratory in the area	-	
15. Get medicine to eradicate termites	Destruction of forests and wood-made products and homes		F=L I=H	-	Consultation with research centers (RAB); Educate the community on the use of the products, Mobilize resources to acquire the products that kill termites	Stopping termites from eating the trees, wood products, and destroying crops	Reforestation, Stopping the disturbance of crops and livelihood products	601 ha of forests concerned	# of hectares sprayed with the product	-	
16. To build a fence to protect assets from wild animals	Wild animals attack – harming people, crop, and livestock		F=Low I=High	RDB started the building	-	Stopping animals from entering property	Stopping the disturbance of animals from destroying the crops	28 km of fence	# of km fenced in.	-	